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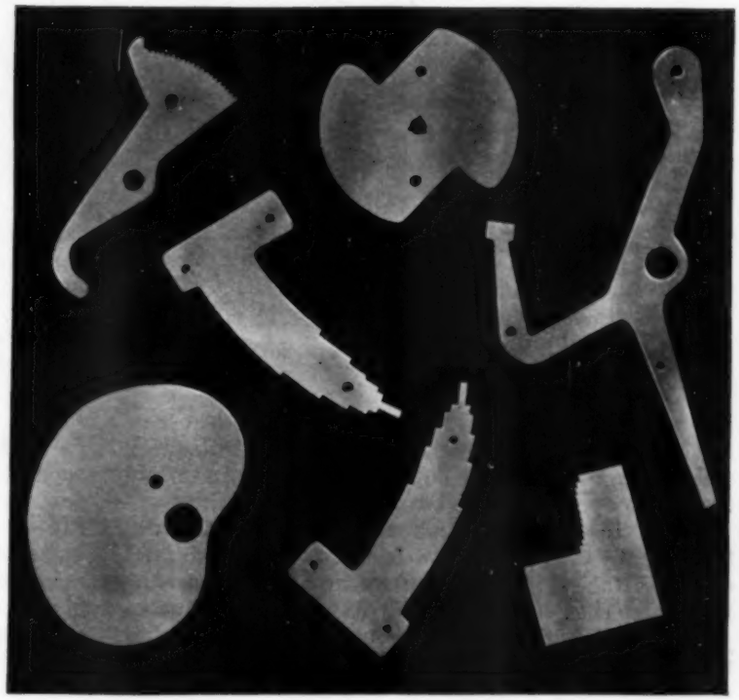
Stampings of Rustless Steel

"It CAN'T be done" failed to halt the production plans of the Brown Instrument Company. Careful attention to die design and heat-treatment resulted in pyrometer part stampings which were accurate to plus or minus 0.001 in.



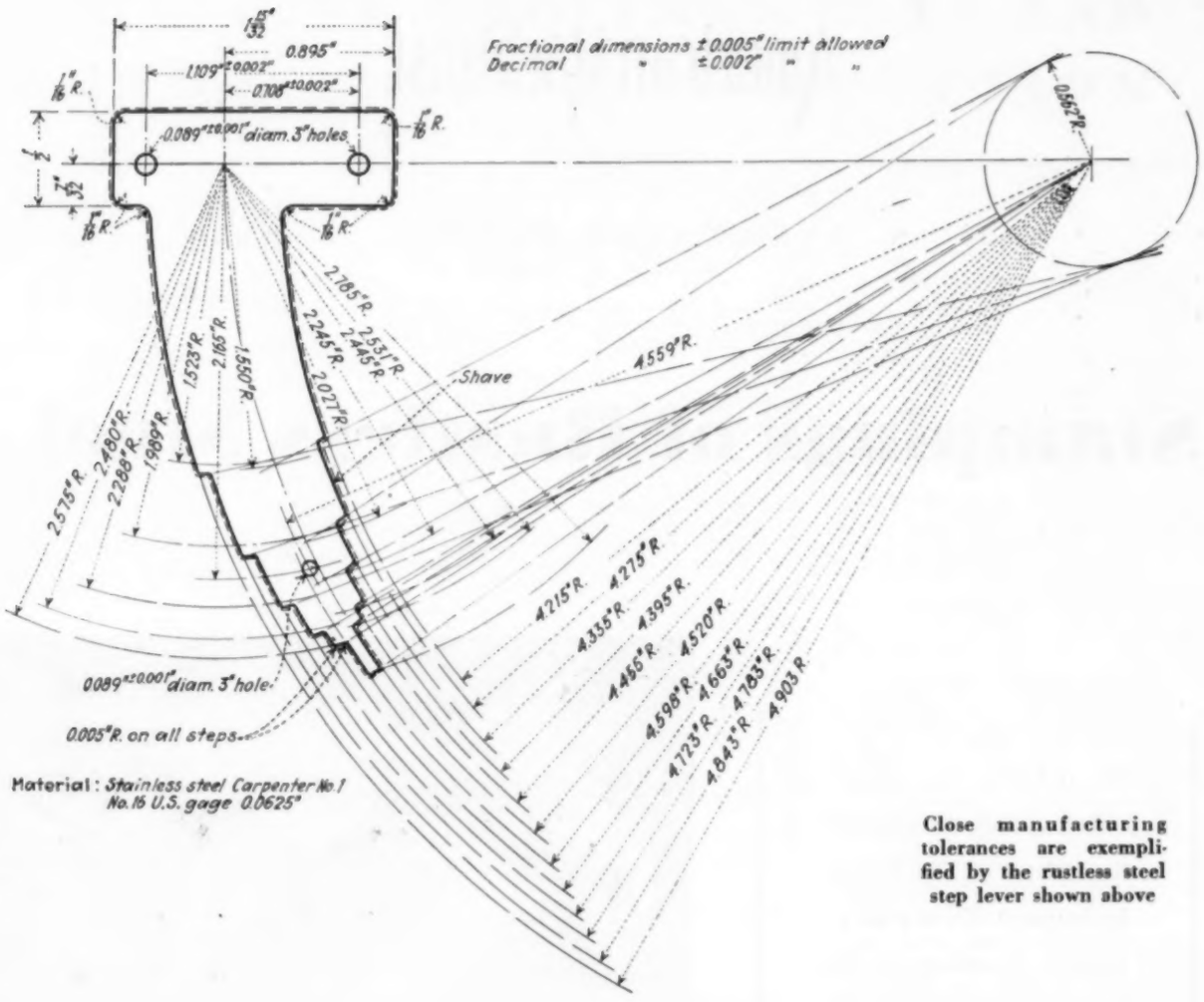
Punching, blanking and shaving finish these parts to final dimensions without hand operations of any kind

WALTER C. SCHMIDT
Tool Engineer, Brown Instrument Company

EXTENSIVE use of high-strength heat-treated alloy steels for strong parts of minimum size has increased the exactness required of heat-treating methods. Accurate uniform heat-treatment calls for close control, which in turn demands sensitive measuring equipment. In the construction of this accurate control equipment, heat-treatment plays a most important part.

Brown Instrument Company, in its new recording potentiometer-pyrometers and other instruments, uses control cams, step levers and other parts fabricated of rustless steels of the 18–8 type. These parts were at first turned, milled or otherwise machined to maintain the necessary accuracy and were then a formidable element of cost. They are now being blanked and shaved to tolerances of ±0.001 in. on a production basis without hand finishing of any sort.

The group illustrated is indicative of the intricacy of most of these parts, yet all their dimensions are to tolerances indicated on the drawing of the step lever. This lever is the heart of the pyrometer—any inaccuracy in it is multiplied many times in the operation of the instrument. Yet it and other parts, including cams in stock up to $\frac{1}{32}$ in. thick, are produced in three operations, punching, blanking and shaving. Parts as



Close manufacturing tolerances are exemplified by the rustless steel step lever shown above

finished have square-cut faces, no rounded shoulders and no appreciable burr. The cam faces are smooth enough to operate the follow rolls without difficulty.

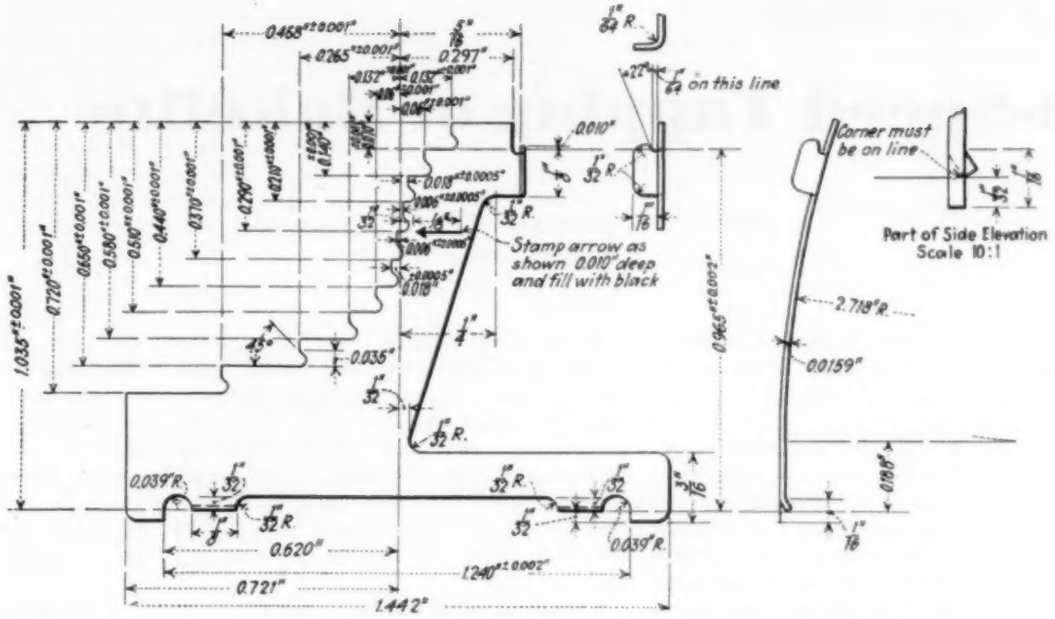
When this method of manufacture was anticipated, the company communicated with a number of large fabricators in the effort to obtain information on blanking rustless steel. Not only was it discovered that little or no information was available, but most companies added that blanking to the required accuracy was both unthinkable and impossible. Dies made outside were rejected for inaccuracy. So Brown now makes its own —and all of them work. The answer is of course in the tool department.

The blanking dies used are of vanadium steel and are heat-treated to a Rockwell hardness of C65. Shaving dies are of high-carbon, high-chrome and semi-high-speed steel, heat-treated to a hardness of C64–65. Since several differences in design and heat-treating are employed, each type will be described in turn.

Blanking dies are made with wider clearances than those used ordinarily. Die clearance is set at 1½ times that shown in *American Machinist's Handbook* for the hardest cold-rolled stock. For example, where the *Handbook* shows 5–12 per cent of stock thickness for clearance on 0.090-in. cold-rolled steel, 12 per cent or more is used on these dies. Die and punch faces are ground square and then lapped. Die cutting edges have a taper of 0.1 deg. for $\frac{1}{16}$ in., then 0.75 deg. for the remainder of the clearance hole. This gives maximum support to the cutting edges, yet allows $\frac{1}{16}$ in. of stock for regrinding, all that will be needed for the full life of the die. The punch is tapered outward, just opposite to conventional practice. The taper is ½–1 deg., enough to provide ease in stripping. Both punch and die are stoned to produce smooth cutting edges and surfaces, so that neither offers the slightest obstruction to the stock. The stripper is about double the strength of those for stripping cold-rolled in order to take the extra "pull" of rustless steel. The press capacity is also doubled. For example, if the press for a blanking operation in cold-rolled is of 25,000-lb. capacity, that for rustless steel should be 50,000 lb.

Shaving dies are similarly constructed, except of course that punch and die are a close fit. The punch drives the blank practically through the die. Both are straight-faced except that the die has just a shade of taper, possibly $\frac{1}{10}$ to $\frac{1}{20}$ deg. Both punch and die are stoned smooth. It is particularly important that final stoning be in the direction of motion of the punch in order to remove all lateral scratches. These scratches will pick up chromium and cause the die to bind. Press capacity should again be double that used for cold-rolled stock.

Only one lubricant, pure animal lard oil, has been found successful for the blanking and shaving operations. Anything else causes trouble in short order.



Galvanometer table steps provide another example of precision obtained from a well-designed dieset

Normally, as the blank is formed, it makes a report like a pistol shot, but if the wrong lubricant is used, the report is magnified to a crash.

The required accuracy in aligning punch and die is obtained by using precision diesets and removing them only when dies must be reground. As a consequence of this policy, Brown Instrument Company now has four large vaults of dies, jigs and fixtures for current models. Some of these have been used regularly for the past two years but still have sharp cutting edges and show little if any wear. Regrinding is usually only a matter of resurfacing.

Heat-treatment of these dies is likewise a special operation, which must be done in a furnace, either gas or electric, that is capable of close control. Procedure is different for each type of die.

Blanking dies are placed on specially made perforated bricks in the center of the furnace. Porous firebricks are used with large holes through their major dimension, thus permitting complete circulation of the heat. Dies are set back from the cooler zone near the door and well into the center of the furnace, not touching walls, roof or furnace floor. The thermocouple is placed close to the die. The die is heated slowly to 1,420 deg. F.—and by "slowly" is meant about half the usual rate — held at that temperature for 20 minutes, then quenched in brine. It is removed from the quench when it is still above room temperature, say at about 200 deg. F., put immediately into a salt tempering bath and held at 425 deg. F. for two hours. A die thus treated will not be distorted, will require no hand stoning other than that necessary to remove scale, and will have a Rockwell hardness of C65.

Shaving dies are similarly located and arranged in the furnace. They are heated slowly to 1,750 deg. F., held at that heat for 15 min., then quenched in soluble oil. They remain in the oil until they reach a temperature of about 200 deg. F., when they are transferred to the salt tempering bath and drawn for three hours at 375 deg. F. These dies have a hardness of C64–65, are very tough, and show no measurable distortion or shrinkage. The punches are hardened to C40, because they are used for pushing the blank through. Should anything go wrong, the punch will be the part damaged.

That this procedure works is evident from the fact that in eight years this shop has never lost a good die in heat-treatment and in that time has not had one that failed in service. Usually the dies show production tolerances of a thousandth or less, thus being well within the required manufacturing limits. These results are possible because the men are exceptionally skilled die and tool makers, most of them having received their preliminary training in precision tool shops of electrical, adding machine, clock and similar factories. The present business condition has aided the superintendent in building up his staff, since he has been able to obtain experts that in normal times would be heads of their own departments.

Preventing Screw-Head Marks

C. H. HAYS

In the assembly of parts having highly finished surfaces, such as enameled parts, polished Bakelite panels, in fact, any high-grade finished parts assembled with ordinary machine screws, we were troubled by the circular markings made by the screw heads. Because the heads and the bodies of the screws are not always concentric and the clearance holes in the work are usually plenty free for fast assembly, the screw heads will make circular markings greater than their diameter. The result is that when the screws are finally tightened, there is a scratched appearance around their heads.

To prevent this trouble, we use black paper washers having a thickness of about 0.10 in. and about 0.015 to 0.030 in. larger in diameter than the screw heads, this being in proportion to the screw sizes. The paper washers act much the same as the ordinary washers and permit eccentric action of the screws without marking

High-Speed Tapping of Bakelite

HERMAN GOLDBERG
Chief Engineer, R. G. Haskins Company

MOST production men consider Bakelite a difficult material to tap. It is all too easy to strip the threads, and tap life under ordinary conditions is wastefully short.

An obvious way out of the difficulty is to use metal inserts tapped before insertion in the mold. Metal inserts are cheap enough in themselves, but are expensive when account is taken of the time to set them. They hold up production on costly dies and presses, and in high-production work may even necessitate added presses and dies to maintain a given production. In fact, it was to avoid just such a duplication of equipment that a study was undertaken to lick the problem of tapping holes directly in Bakelite. The experiments were carried on in a plant that does nothing else but mold Bakelite. As a result of the investigation, tapping costs were brought down to a point a little below that of the inserts. Gains were made in savings in overhead on additional equipment and in greatly increased output per press over what would be possible using metal inserts.

Tapping Bakelite presents a problem that is entirely different from that of tapping metals. In tapping a molded synthetic resin, the hole seems to shrink slightly while being tapped and on reversal of the spindle there is a decided lapping action on the tap. This, together with the normal abrasive action of Bakelite, causes rapid wear and short life of taps used for this service.

Tests were made to determine the critical speeds for operating the various sizes of taps, the type of tap best suited for Bakelite and the tool life that can be expected. It was found that the ordinary carbon tap, regardless of the speed at which it is run, has a very short life. At the most, about 300 to 400 holes were all that could be threaded before the tap was worn out and thrown away. A high-speed steel tap showed slightly better results, but the most that could be hoped for was about 600 to 700 holes.

The best results were obtained with a high-speed steel tap that had the threads ground and then chromium plated. With this type of tap, an average of 1,200 to 1,300 holes were threaded per sharpening of the tap. The flutes should be ground after every third sharpening.

Ordinarily a chromium-plated tap can be resharpened and replated a number of times. These experiments showed that the tap could be resharpened from 9 to 12 times, provided it was not run too long nor dulled too much. If the tap were allowed to thread 1,500 holes, for example, instead of 1,200, it would be found that the entire portion of the tap that goes into the threaded hole would be worn so badly that that much of the tap would have to be cut off and the remaining stub resharpened—an extremely wasteful procedure. Hence, it is obvious that a fairly accurate check should be made of the exact number of holes that can be tapped before too much wear occurs.

A tap that is taken out at the proper time looks as though it is still sharp and shows little dullness. The edges have a slight rounding that can be barely seen with the naked eye, but under the glass, this rounding is quite apparent and indicates that the tap should be resharpened. In threading Bakelite, when a tap loses its edge, much more resistance to turning is encountered, and the tendency is to crack and chip out the edges of the hole. The tap also becomes hotter, soon stripping the threads.

Proper speed for the various sizes of taps in Bakelite as indicated by these tests are as follows:

Tap size	Speed, r.p.m.
No. 4	1,750
" 6	1,500
" 8	1,150
" 10	900
" 12	750
" ¼ in.	650

At these speeds the maximum life per tap is attained. Decreasing the speed will not increase the life. Increasing the speed will shorten the life in proportion to the increased speed.

The best type of tap to use for Bakelite is one with three or four flutes. A gun tap is not suitable on account of the wide land, which creates too much frictional heat and causes the tapped hole to shrink, wearing the tap away rapidly. Little pressure should be used on the tap, which should be free to take its own lead, and the fixture used to hold the part should allow the piece being tapped to float up with the tap a short distance. Otherwise the first two threads will be stripped when the tap backs out. All that is necessary to accomplish this is to have a fixture that permits the piece to raise up slightly so that it can be pushed off the tap by hand.

Particularly when tapping very small holes (No. 2), is it necessary to have a sensitive tapping unit and one that has the smallest amount of inertia in the rotating parts beyond the reversing clutch. The experiments mentioned were carried out in a Haskins high-speed tapping unit featuring a high-speed motor-driven spindle with a reversing clutch and tap chuck of light weight, together with the absence of any spindle float other than the vertical float necessary for clutching in forward and reverse.

Reducing the Cost of Diemaking

EDWARD LAY

WHEN a sheet-metal part requires blanking and forming, the forming die should be made first. Before commencing work on the blanking die, time

should be allowed for cutting out a few trial blanks by hand, according to the layout on the blueprint.

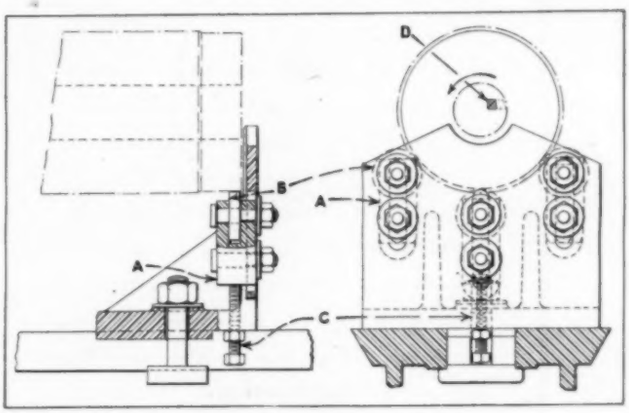
These blanks can then be put through the forming die. If the finished part is up to the specified dimensions, then it proves that the blank layout is O.K. The blanking die can now be started. While this procedure is not new, it is safe and should be adopted as standard. Had it been followed in the shop where I am employed, the scrapping of a $150 blanking die would have been avoided.

An All Arc-Welded Steadyrest
Discussion

HENRY W. BOEHLY

THE ARTICLE under the title given above by Harry Shaw (*AM*—Vol. 76, page 243) brings to my mind an actual experience which supports his point as to the importance of weight in a steadyrest.

It was required to bore accurate holes through the centers of cylindrical castings that were to be used as rotors for centrifugal pumps, the finished outside di-



mensions being 18 in. in diameter and 40 in. in length. In boring the holes, it was necessary to use a special steadyrest that would permit access to the front ends of the rotors. We first made a steadyrest of the built-up type. It proved a failure for several reasons, including the one of being too light.

With this experience in mind, we designed the steadyrest illustrated. The angle-plate frame is a steel casting having three slots in the vertical member to serve as guides for the roller blocks *A*, each block sliding vertically and being provided with two through bolts to tighten it to the plate. The upper bolts each carry a ball-bearing roller at *B*. After the blocks have been adjusted and tightened, the rollers are free to revolve. Placed under the central block, the thrust screw *C* prevents the block from being forced downward by the heavy load on its roller, thus giving rigid support to the work and avoiding the difficulties with in the first attempt.

After machining a spot about 2 in. in length on the work for the rollers to bear upon, the steadyrest is put in place and the roller blocks are adjusted and tightened before the tailstock center is removed. In boring, the lathe is run backward, the tool being at the far side of the hole and upside down, as at *D*, thus developing a downward thrust against the rollers.

Stoning After Grinding

EUGENE BOUTON

Tractor Works, J. I. Case Co.

PRODUCTION men regularly discuss how much better a stoned tool is than a tool which is ground only. The opinion is almost unanimous and universally accepted that the stoned tool is much better, but how much better no one seems to know.

Recently, I tried out some tools, both high-speed and Stellite, and compared the results of grinding and stoning. The result was approximately 37 per cent greater cutting life with the stoned tool than the one which was ground only. While this percentage is obviously not a general average, it at any rate is conclusive proof that stoned tools give more pieces per grind than those which are ground only.

In the old days it was common practice to have a grindstone beside the grinding wheel, and it was customary to finish the cutting edge of the tool on the grindstone. Sometimes I wonder if elimination of the grindstone was not a mistake. Results obtained from stoned tools would seem to indicate that it was.

All tungsten-carbide tool manufacturers practically demand that their tools be stoned after grinding. How they are to be stoned matters little except that we know a large part of it is done by hand, which takes considerable time and offers considerable delay in getting the tool back to work. It was to eliminate this hand stoning which prompted us to stone by mechanical means. The results obtained were far beyond what we had hoped for, not only in the cutting action, but in the time required to finish the tool. We adapted a commercial tool grinder for the work. While it was never intended for such work, it has all the features desired. It is not necessary to grind on the periphery of the wheels, but tools can be ground on the sides to eliminate radii on the cutting edges. The unit also has a cone-shaped wheel for smoothing out cutting lips on the top side of the tool and a wheel with a leather face for stropping, if necessary. It appears to me that such a tool might become the equipment of every metal-working plant.

Increasing the Inside Diameter of Helical Springs

C. H. HAYS

WE received a quantity of helical compression springs wound from music wire and having an inside diameter from 0.003 to 0.008 in. too small for the required purpose. It was necessary that these springs be free on a ¼-in. square brass rod. As our blueprint was in error, we had no recourse from the manufacturer, so it was up to us to try to reclaim them.

After a few stunts were tried, reclaiming was found to be comparatively simple. By inserting a ¼-in. square rod in the springs and giving them two or three light blows with a rawhide mallet, the springs expanded to the desired inside diameter. This treatment did not change the springs in appearance, nor harm them in any way. A boy did the work, saving delay and the cost of another lot of springs. This method may help someone in the same position, as it did us, where freedom from delay is more important than the actual cost.

EXECUTIVE FORUM

No Admittance

Secrecy in manufacturing methods has diminished greatly since the World War when cooperative action was imperative. But in some plants, this practice still persists because of the belief that certain advantages are gained from the exclusive use of a process. Undoubtedly such plants have a right to maintain their privacy. But in the long run do they profit by it? Do they gain more than they lose by putting up a wall between themselves and others, thus restricting the free interchange of technical and mechanical information? What do you think about this problem?

APPARENTLY Bill Holland never tired of metalworking plants and their methods. He contended that, every time he walked through one, he learned something new. This was not his first trip through the shops of the Express Machine Company, and as usual, many of the new machines and shop practices caught his eye. In company with Bert Jennings, works manager, he reached the end of the machine shop and started to turn into a wing at the right.

"Not that way," cautioned Jennings, pointing to a large "No Admittance" sign on the door.

"That used to be your heat-treating department," said Bill. "I went through it the last time I was here."

"It's still used for heat-treating," said Jennings. "But since we developed our new process, we closed it off. There's no use telling all we know."

"More secrets," laughed Bill. "Well, suit yourself, but I thought that idea died with the war."

"It's being revived here," said Jennings. "We used to have a lot of trouble with some of our parts. We spent considerable time experimenting with materials and heat-treatments. We even called in an expert consultant. At last, I found what was wrong, and now I'm keeping it under my hat."

"Are your competitors having trouble with these same parts?" asked Bill.

"Not that I know of," said Jennings. "I have enough to do with my own problems without worrying about theirs."

"I've seen many secret processes in my day," said Bill, "and I wouldn't have more than one in ten for a gift. The other nine are inferior to accepted practice, but the fact that they are guarded sets them up on a pedestal. A shop hangs onto these inefficient methods long after they would be ordinarily thrown out."

"Our process is one of the good ones," said Jennings. "At any rate, our shop methods are part of our stock in trade. We pay good money to develop them, and we're not giving them away."

"They all think their own methods are the best," said Bill. "But even from a selfish standpoint, you're defeating your own purpose. Why didn't you go to someone in the same field and ask how they did the operation you had trouble with. They'd probably be glad to tell you."

"Yes, and then they'd come back and expect me to tell all my methods," said Jennings. "Not for me."

"You'd be a lot better off," said Bill. "The industries that have gone farthest and grown fastest have freely interchanged information. Secrecy means stagnation and does the greatest harm to the shop that sponsors it. It leads to reprisals in other plants in the same field, and before long, an entire industry is tied up. Each company uses private methods, deluding itself with the idea that it has the only way."

"In general, what you say is correct," said Jennings. "But certain problems, like our heat-treatment, are different. When a process is an important part of a company's product and involves a novel method, that company is justified in guarding it. Why would anyone spend money on research if the whole industry profited by the use of its findings?"

"Because by pooling efficient methods each company gains more than it contributes. Everyone considers his problem to be different, but when it's brought out into the open it looks much like thousands of others."

Discussions Of Former Subjects

Mourning Becomes Executive

During 1928 and 1929, the man who got only a fairly good salary felt that he deserved more on account of the earnings of the company. The man who received a small salary but in addition a large bonus lived on the fat of the land and spent money like a drunken sailor. Good days were here to stay, and one could always earn a good bonus.

Now conditions have changed considerably. The man on a salary has had several cuts and his living conditions have been changed somewhat. The man with the large bonus is in a deplorable condition. Payments on his home and automobile are eating up his meager salary, and the extra money he had put aside was in stocks on margin.

The ideal condition is to have a fair salary with a bonus after a certain quota has been reached. It will stabilize the man's living conditions and still give that extra something that means a lot to every one of us.

—E. F. WERNER, *Superintendent, American Fixture & Showcase Manufacturing Company.*

In the three plans of paying executives and key men, straight salary, salary plus bonus, and salary plus stock-ownership, merit and weakness are to be found in each. An executive should be adequately paid according to the value of his services. These depend not altogether upon the executive himself or his own work, but upon other things not within his control, such as business conditions. It is, therefore, right that in times of good business and large profits, the executive share in the prosperity of the company, and that, when business is poor, his compensation become smaller.

The degree of success or failure of this plan depends on determining correctly the amount to be paid as salary and the amount to be paid as bonus. These two must bear a correct relation to each other if the executive is to receive at all times a just and proper compensation. The tendency seems to be to fix the salary too low and the bonus too high, resulting in an excessive lowering of the executive's income in times of poor business. —OSKAR KYLIN.

A bonus is always an incentive to any class of labor to do better work, whether it be the sweeper or the general manager. The executive who feels the loss of a bonus in dull times is going to put forth more effort than a straight salaried man to bring business back to normal.

The bonus system helps to keep the salary intact and gives the executive a definite amount to figure on in slack times. If he is working on a straight salary then when slack times come, it has to be cut, and he does not know what it will be until the crash is upon him. Then he loses heart because his actual salary is affected. The company I am working for has been on the bonus plan for years, and I like it a lot better than the straight salary system.

—L. G. PATTERSON, *Factory Superintendent, Armstrong Machine Works.*

Hand to Mouth

Buying from hand to mouth is a sure way of eliminating the cost of maintaining stocks, but the wisdom of such a policy depends on the accuracy with which the demands on the stock can be determined. Emergency demands have to be estimated where a reputation for service is required.

While the change to the present buying policy may have accentuated unduly the decrease in the volume of trade, it is surely sounder for reserve material supplies to be concentrated in the hands of the suppliers and manufacturers. The uncertain exess stock charges are replaced by increased manufacturing costs, which are readily estimated and ascertained.

—S. A. KNIGHT, *Stratford, England.*

Within the last few years, the changes in style, which have come about in practically every manufactured article, from the lowly alarm clock to the massive electric welded generator, have been such that the old easy-going way of sitting down and planning a year's production in advance has disappeared. The efforts of the designing and sales departments, to create new products to bolster up sales, make this policy as obsolete as a model T Ford.

As a result of the present depression, business in general is in a better strategic position because of the reduction of unwieldy inventories. As soon as definite assurance can be secured that commodity prices have reached their lowest level, it would be nothing but good business to anticipate future requirements and to order more liberally of the standard, staple supplies to cover advancing prices. I have heard it expressed that "hand-to-mouth buying" is the best medicine for hand-to-mouth thinking.

—D. GILLOON, *Production Department, York Ice Machinery Corporation.*

Enforced Retirement

If there be no movement from the top, the whole mass from there down, may stagnate. Therefore, presidents should retire, but not necessarily on account of age. A man in that position should not hang on so long that he has to be forced out.

The effect on the organization may be good or bad, but in general, no effect at all will result, as he can only act as a nominal head and referee, and reflect the minds of the shareholders. As long as he is responsible, has common sense and balance, with good business judgment, the organization will function almost automatically, and his personality does not materially hinder or help.

As to the man himself, his functions do not fail until absolute senility takes place, and even at eighty or ninety his mind may be clear and judgment unimpaired. Some men are reactionary at twenty-five, and others progressive at ninety-five.

There seems to be no excuse for these dramatic stories of men who, when forced to retire commit suicide or die of broken hearts. This indicates a want of balance or good sense that must have been reflected in them as executives. JOHN S. ISDALE, *Plant Engineer, International Silver Company.*

Stockholder vs. Employee

In case the surplus has been built up by withholding it from dividends during prosperous times, to be used in increasing the dividend possible after a year of business depression, there is no reason why a portion of it should not be used as suggested by Mr. Holland. A decision to proceed in the manner suggested should, however, be made only after a thorough study of conditions. A case of loss, such as from a flood, for which insurance could not be provided, might cripple the company but for the support of the surplus; or it might be learned that the failure to produce earnings sufficient for the usual dividend was caused not entirely by the general business depression but to obsolete manufacturing methods and that heavy expenditures for equipment and even buildings are required. The depreciation fund, however well protected, might not be nearly large enough to cover this unlooked for cost, and the surplus then must be looked upon as an emergency fund.

It seems certain that employers of labor feel much more keenly their responsibilities to employees than ever before. It is highly desirable that the highest wage levels possible be maintained, but industry must pay a fair return upon the investment in plant and operations, or there can be no industry. In spite of all we can do to keep up rates of pay, they will be controlled to a great extent by supply and demand as in the past. The greatest responsibility which faces employers at the present time, so far as labor is concerned, is that of furnishing steadier employment for all and more employment for the older men.

—H. E. Brookman,
Department of Mechanical Engineering,
University of South Dakota.

As a result of the present industrial system, a continually increasing proportion of the world's wealth is gravitating into investments. The money distributed among the spending public, or wage earners, is not increasing in proportion. This means, that although the world's manufacturers are in a position to produce a much greater variety of commodities than ever before, the people have not the spending capacity to absorb this increased production. This theory seems to indicate that a halt must be called in wage-cutting, and that the spending capacity of wage earners must be increased. There can be no profits without production, and there can be no profitable production without a market for the product. There can be no market without customers with money, or its equivalent. A healthy market would solve the unemployment problem, reduce taxation, and put the world in a stable position.

—P. W. Nielsen,
Wallasey, England.

Itemizing Pricing

There is no question that some machine tool buyers ask for considerably more service than others, and they should pay for it. The selling price includes enough demonstration cost to start the machine properly on one or two jobs, but when the buyer expects the demonstrator to run through some of each piece for a week or two, he should pay the cost.

All machine tool salesmen complain of the service some buyers expect. If the majority of buyers, who require a minimum of service, are not to be penalized, the buyer, who demands ususual service, should pay.

—U. Seth Eberhardt,
Works Manager,
Newark Gear Cutting Machine Co.

The Up Grade

When choosing between the practical and the technical man for a position such as foreman, the company would profit far more by choosing the practical man. While it is true that technical training is indispensable to the man who hopes to advance to a position higher than foreman, and no man should be chosen as foreman unless it is believed that he is capable of further advancement, the practical man would take hold at the start. Since he knows his work he would have the good will of the personnel from the start.

On the contrary, the technical man's advancement would be resented from the start. He would have to overcome this prejudice, all of which would take time as well as prove costly to the company. The practical man could easily acquire a technical knowledge as his experience would enable him to understand readily the technicalities. He could acquire the technical knowledge through home study, which combined with his practical experience and knowledge of his men would place him a few jumps ahead of the technical man.

—W. J. Owens,
Foreman,
Newport Rolling Mill Company.

The technical man should be given first choice. He spent four years in college, studying the theoretical side, and has a small amount of practical experience. This background, to draw from in deciding problems or planning, may be the difference between making money and losing it. The practical man may be just as bright but does not have the technical training to back him up. The technical man must spend a few years getting the practical points of the business, but after this apprenticeship, he is one jump ahead of the practical man. The practical man learns as he goes. The leaders of today must know beforehand at least what has been proved.

—Henry Garges.

Control by Council

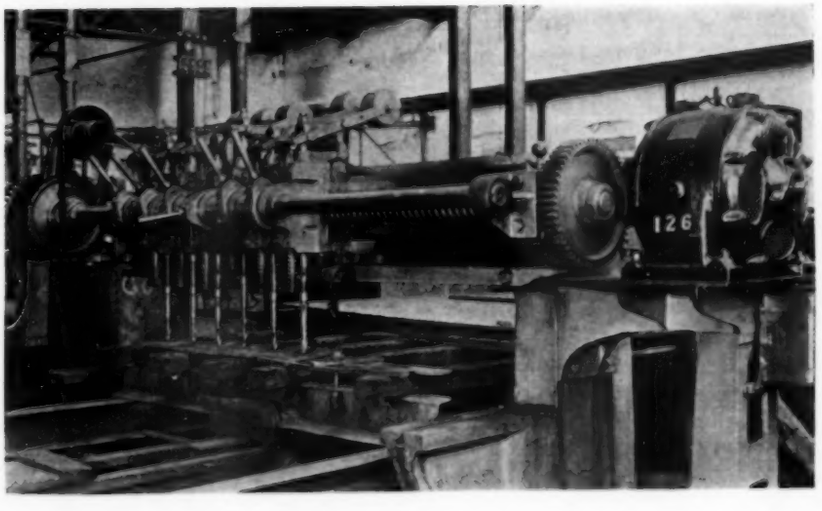
Usually, we judge a man's competence by the accuracy with which his predictions come true. Suppose an engineer should examine a dam and report that it was sound. Then, as it begins to give way in one corner, he reports merely a small local trouble that the repairmen will quickly fix. But then, a whole section of the dam gives way. Then he reports that the pressure has been relieved on the rest of the dam, the worst possible has come, and that the resulting flood will soon pass. Instead, the rest of the dam gives way. We certainly would not trust that engineer with charge of our dams. False prediction is the surest proof of lack of knowledge.

Now look at the statements of the leading business men, bankers, and political leaders. We have seen some of the worst predictions from men in the most prominent places. Some of us have not made quite as bad mistakes, partly because we did not predict as much. But the ignorance of fundamentals as proved by false predictions has been practically universal. If we could find five men who have shown a reasonable degree of understanding of the situation, they surely would not be appointed on the council.

—A. W. Forbes,
Forbes & Myers.

In far off Queensland, locomotives are repaired much as they are in the United States. Here is a second group of views from the government shops there. Boiler plate and sheets are formed in a heavy hydraulic press. Fitting stands and benches are conveniently placed in the rod shop. Jib cranes and a center track expedite material handling. For boiler work, this gang drill is used though not quite as handy as our newer designs

Government Railway Shops in Australia



When Weldings Are Specified

A new drafting-room technique must be employed to give adequate information to shop and mill

G. B. CRAMP
Chief Draftsman, Maintenance Engineering Department, Lukens Steel Company

OFTEN it is said that the preparation of detail drawings for welded steel machinery parts requires less time than for cast iron parts. This is only partly true. Unlike cast parts, welded steel parts, or weldings as they are beginning to be called, are composite pieces usually comprising two or many pieces of plate steel. For this reason, their proper detailing, listing and ordering must follow somewhat the established practice for structural work or steel plate work.

Another consideration is the origin of the design itself. If the design originates in a consulting or contract engineering office, having no affiliated shop connections, and if the drawings are to be submitted to several shops for estimated costs and finally for the fabrication of the parts, then the information to be furnished can seldom be too comprehensive or complete. Shop practice in handling this relatively new line of work has not yet crystallized to any specific standards.

While a welding eliminates the work of the pattern maker and molder, it places an added responsibility upon the draftsman. He must fill with adequate information the present gap between the engineering department and the first mechanics in the line of production who are not always highly skilled in this relatively new field of production. To meet this need, a type of mechanic will eventually be evolved who will probably be known as the templet maker. He may come from the ranks of the present templet makers, layout men, or possibly from those of the pattern makers or draftsmen.

Skilled Specialists Needed

When such highly skilled mechanics have been fully developed and are employed by the shops furnishing gas-cut steel plates, much time and drafting work will be saved in the engineering department. Then the belief that welding drawings can be made more cheaply and rapidly than drawings of cast designs will be much nearer to actual realization.

In the absence of these mechanics, it will be necessary for the detailing draftsman to supplement each drawing with templet sketches which will show the outline of every piece, especially the most intricate shapes, entering into the construction of each detail part. This will enable the less highly developed layout men, usually employed, to lay out the pieces required.

Even though it might be considered unnecessary to accompany the detail parts either with a list of material or templet sketches, the detail of the welding is not altogether simple for it must then include:

1. All dimensions for gas-cutting the various shapes and show the allowance for machining or finishing, either by note or graphically.

2. It must show all necessary welds, give sizes for the same and designate where pieces must be beveled by gas cutting so that a recess is provided in which a back weld may be placed. Adequate dimensions for unfinished or rough sizes of the parts must be given to assist the weld shop assembly mechanic in setting up the pieces to form the composite detail.

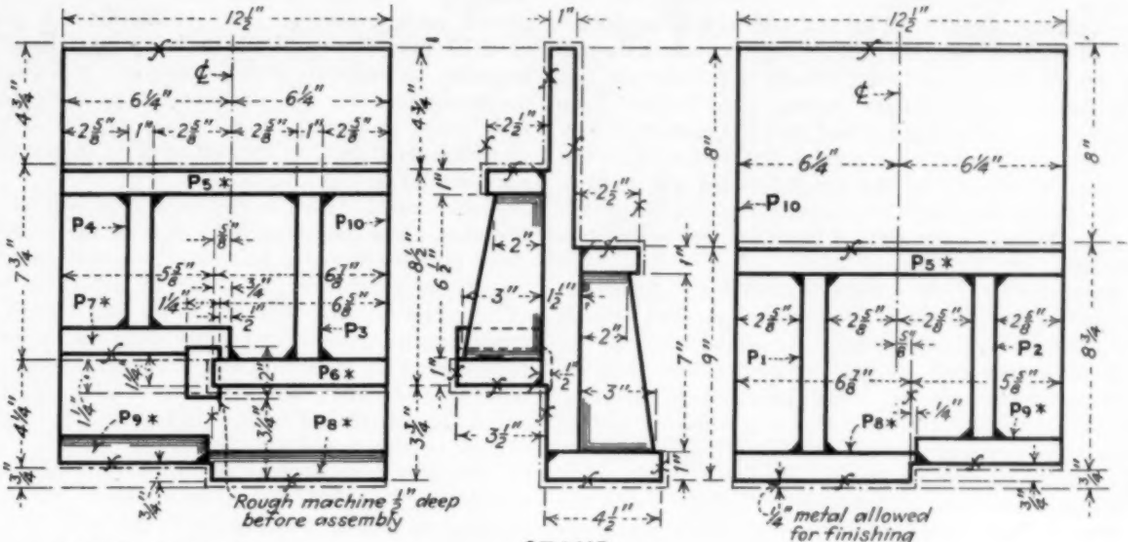
3. All necessary finish marks and machining operations should be shown so that the same detail drawing that is used for gas cutting pieces, assembly and welding may be used in machining. All pre-machining operations that precede the assembly of the pieces should be designated by notation on the detail involved.

Detailing a Job to be Welded

By way of illustration, it will be assumed that the stand, shown detailed in Fig. 1, originated in an engineering office, having no shop affiliations, and is to be sent to various contract weld shops for estimate and quotation, and later by the successful bidder, to one or more plate mills who will furnish the gas-cut pieces exactly to the shapes required.

Many contract shops have competent templet makers, or layout men, who could readily take off sizes and shapes of all pieces comprising this part, especially when the part is so simple and as completely detailed as in Fig. 1. But where more complex machine parts are involved, the possibility of error at the mill is greatly enhanced when no templet sketches accompany the detail. Such errors result in considerable delay, inasmuch as the pieces on which the error has been made must be refurnished by the mill. Since one of the advantages of weldings is the speed at which they can be produced, it is important that all information possible shall be supplied in order that any chance of error between engineering office, contract shop and mill shall be avoided.

The stand as detailed in Fig. 1 necessarily shows more detail dimensions than if this part were to be cast. The rib pieces *P*1, *P*2, *P*3 and *P*4 must be dimensioned at both top and bottom. By referring to the bill of material, it will be seen that the lengths of these pieces are slightly less than the distance between the pieces *P*5 and *P*6 or *P*7 on one side, and *P*5 and *P*8 or *P*9 on the opposite side. This is to permit the pieces *P*1, *P*2, *P*3 and *P*4 to be set in place between the top and bottom



STAND

Steel Plate – Two required

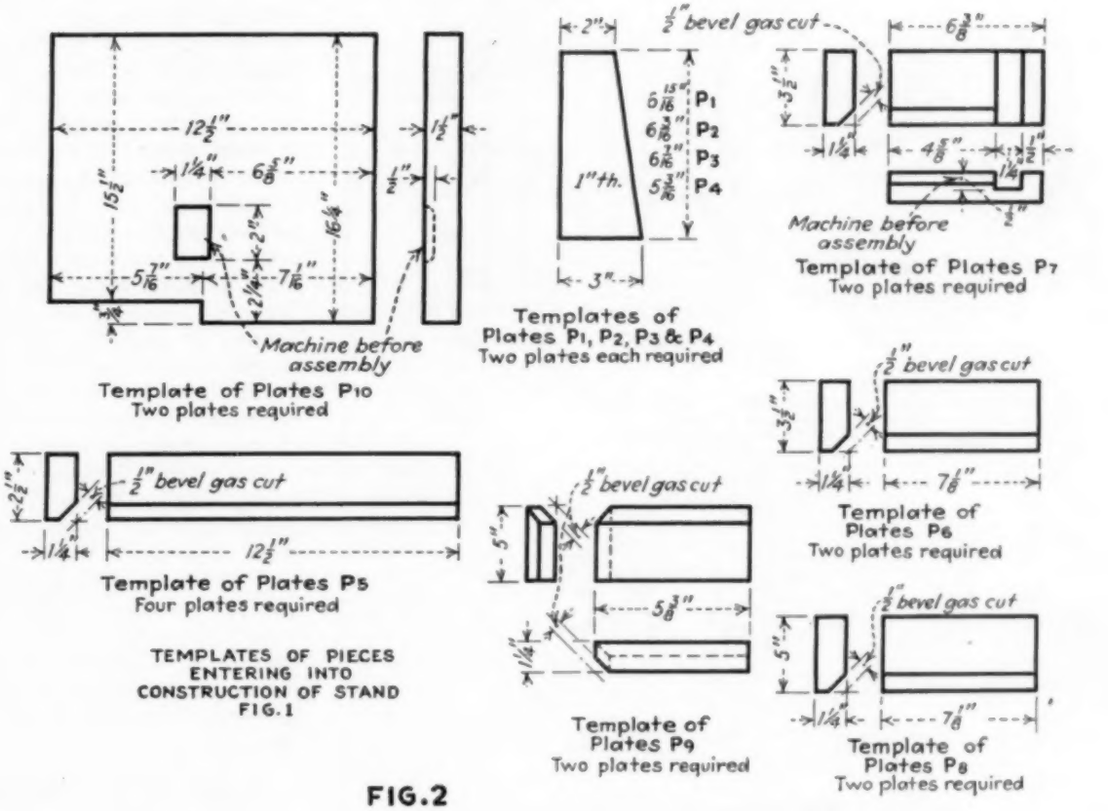
List of material for one stand

1 – 1" × 2" × 3" × 6 15/16"	P1	1 – 1¼" × 5" × 7⅛"	P8 *
1 – 1" × 2" × 3" × 6 3/16"	P2	1 – 1¼" × 5" × 5⅜"	P9 *
1 – 1" × 2" × 3" × 6 7/16"	P3	1 – 1½" × 12½" × 16¼"	P10 see machine note
1 – 1" × 2" × 3" × 5 3/16"	P4	Note:-	
2 – 1¼" × 2½" × 12½"	P5 *	All pieces marked * to be bevel gas cut for back welding	
1 – 1¼" × 3½" × 7⅛"	P6 *		
1 – 1¼" × 3½" × 6⅜"	P7 * see machine note		

Outside welds ⅜"
Back welds ½" to allow for finishing

Detail of gas cut bevel on pieces marked *

FIG. 1



Template of Plates P10
Two plates required

Templates of Plates P1, P2, P3 & P4
Two plates each required

Template of Plates P7
Two plates required

Template of Plates P5
Four plates required

Template of Plates P6
Two plates required

Template of Plates P9
Two plates required

Template of Plates P8
Two plates required

TEMPLATES OF PIECES ENTERING INTO CONSTRUCTION OF STAND
FIG. 1

FIG. 2

pieces without forcing them into position in case the top and bottom pieces are welded to the mid rib piece *P*10 first. From the foregoing, it will be noted that the list of material serves a useful purpose in that the exact length of each of the rib pieces is given which is not easily shown by dimensioning though the allowance for fitting these pieces without forcing may be noted as information to the templet maker and gas cutter. Other advantages of the list of material are to facilitate the estimation of weights of the several pieces and to further designate any special work that may be required, such as indicated by the mark * and the notes relative to machining.

In the lower left-hand corner of sheet Fig. 1, is shown the detail of the gas cut bevel on pieces marked *. All pieces marked thus on the detail or in the material list are to be so bevelled by gas cutting by the shop or mill furnishing the pieces. It will be noted on referring to the size of the gas cut bevel that it is sufficiently large to permit the deposit of a ½ in. weld. This is sufficient weld material to provide the specified ⅜-in. weld after machining to hold the pieces together. Such welds are here termed "back welds" to distinguish them from plain outside welds. Thus the machined surfaces of the part present a continuous and finished appearance after machining.

Where no list of material or templet sketches are furnished, the detail should show in dot and dash lines the outline of the pieces before machining or else a note should indicate the amount of metal allowed for finishing. The conventional mark for designating a machined surface may be used. Sometimes a piece such as *P*10 may be required to be pre-machined before assembly in order to provide adequate tool clearance in machining. Such pre-machining operations should be duly noted as in Fig. 1 and when templet sketches are provided, as shown on templet of *P*10, in the upper left hand corner of Fig. 20.

Since a weld shown in end view only will be taken by the shop to be continuous throughout the length of the piece unless otherwise marked, the detail should designate either graphically, as shown by light lines in Fig. 1, or by notation, that they are to be intermittent. If the exact lengths of welds and intervening spaces are desired, they should be noted on the drawing. When, for the sake of appearance, it might be desirable to fill the intervening spaces with a smaller weld, the size of that weld should be also noted.

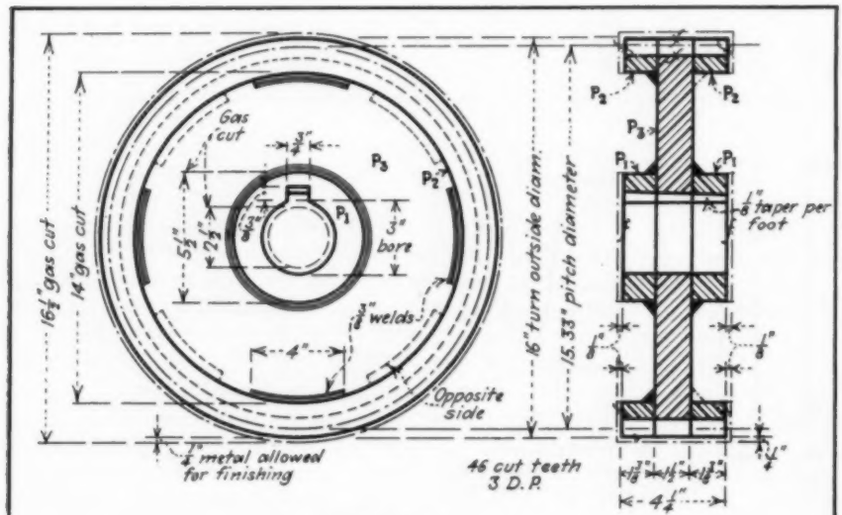
The spur gear represented in Fig. 3 is a relatively simple welding but offers opportunity for error and consequent delays if not properly detailed. An adequate detail covers all gas cutting, finish allowance, welding, machining and gear-tooth cutting information and is in itself entirely complete as a welding detail without a supplementary list of material or templet sketches. When these do not accompany the detail, it is well to employ the piece marks *P*1, *P*2 and *P*3, so any of these pieces may be specifically referred to by office, shop or mill in the event that any question or error arises.

However, a list of material is as useful in welding as in structural detailing. It furnishes a check against the detail, gives the number of pieces required and facilitates ordering by permitting the order clerk to designate such parts simply by listing on an order instead of by drawing.

The templet sketches likewise serve an important use. Most frequently, they occupy less space than the detail part, and a print may often accompany a letter requesting quotation. When resorting to this practice, the number of pieces called for on the templet sketch should conform to that on the quotation request so that no question arises on the part of the mill or shop relative to numbers required.

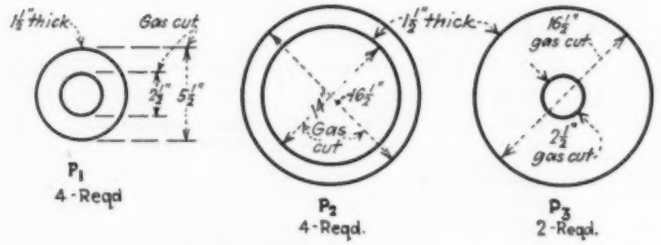
The practice outlined for detailing, listing and ordering welded spur gears may be followed for miter gears, a detail of which is shown in Fig. 4. As it is entirely possible to gas cut the bevel disks and rings, entering into the construction of the miter gear, all figures for gas cutting are given on the detail of the gear, as is all other welding and machining information.

In the list of material, it will be noted that the pieces *P*2, *P*3 and *P*4 are given two outside diameters, which correspond to the two edges of



Spur Gear
Steel Plate 2 Reqd.
List of Material for One Gear
2-1½" x 2½" I.D. x 5½" O.D. P_1
2-1½" x 14" I.D. x 16½" O.D. P_2
1-1½" x 2½" I.D. x 16½ O.D. P_3

FIG. 3



Templates of Pieces Entering Into Construction of Spur Gear

the bevel. These figures check with the detail of the part proper and also with templet sketches.

Both in the detail and templet sketches the angles of the bevels for pieces *P*2, *P*3 and *P*4 are given. This information is useful to the gas cutter in setting his radiograph, enabling him to cut the bevels required in a single operation by setting the flame at the required angle in cutting the circle.

These examples show a few of the ways time can be saved in the shop and mill if proper information is provided. In laying out his drawings, the designer should endeavor to visualize the various steps in the fabrication of weldings and to anticipate as much as possible information that will be required in the shop. Only in this way will the full advantages and economies made possible by the use of welding be realized.

Generally speaking, the following procedure in ordering weldings works well:

(1) When it is known that the welding contractor has a templet department, full details of the parts should be given, but no list of material or templet sketches need be supplied.

(2) When it is not known whether the contractor has a templet department, both the list of material and the templet sketches should be included.

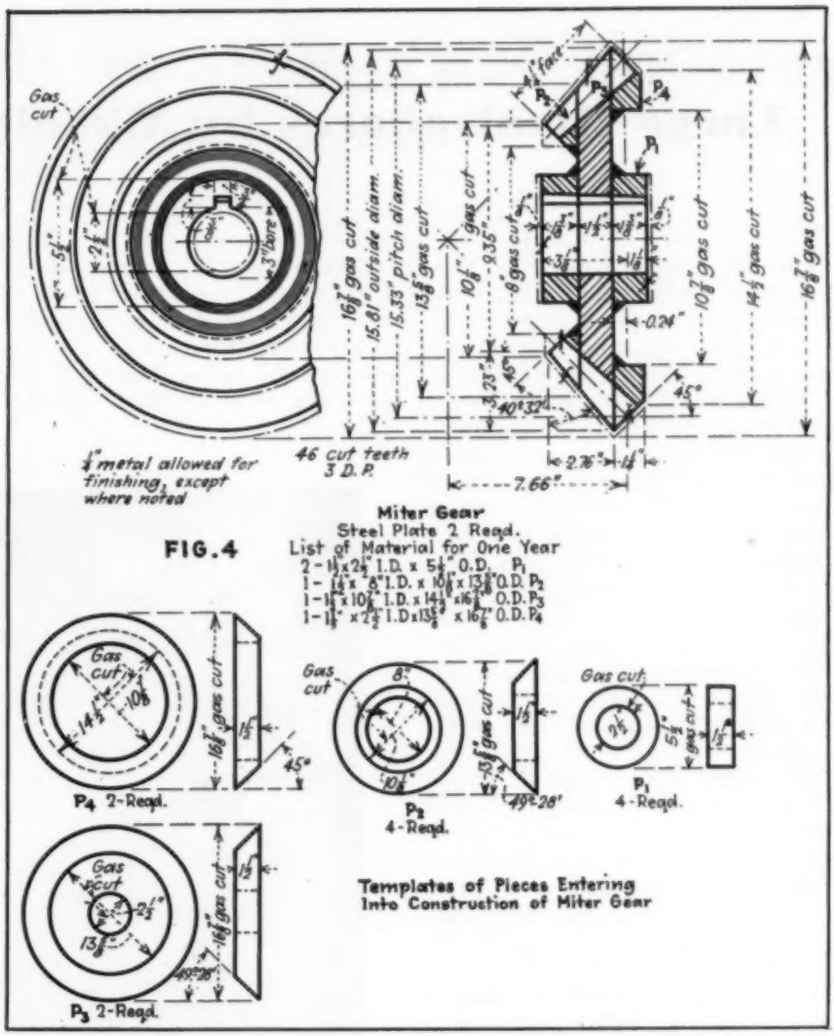


FIG. 4 Templates of Pieces Entering Into Construction of Miter Gear

A Right Angle Drive

JOHN T. GIDDINGS

HERE IS an unusual problem in helical gearing which may be of interest. A pair of helical gears on an imported machine were to be replaced as they were considerably worn. Although both gears were exactly the same diameter, one had twice as many teeth as the other. The problem may be stated as follows: Required a pair of helical gears with a ratio of 1:2 to go in a fixed center distance of 6¼ in., the shafts to be at right angles. Driving gear 25 teeth, 6¼ in. P.D. Follower gear 50 teeth, 6¼ in. P. D. Both gears to be cut with a 9 D.P. cutter, normal pitch, 0.3491.

Using the American Machinists' Handbook, the cutters may be selected from a table. They are for the driver, No. 1 and for the follower, No. 2.

$$6\tfrac{1}{4} \text{ in. diameter} = 19.635 \text{ in. circumference}$$

$$\text{Circular pitch of driver} = \frac{19.635}{25} = 0.7854$$

$$\text{Circular pitch of follower} = \frac{19.635}{50} = 0.3927$$

In the practical treatise on gearing of the Brown & Sharpe Manufacturing Company, we find the following rule: "Multiply the cosine of the angle of helix by the circular pitch, and the product will be the normal pitch." Then to get the cosine of angle by transposing we have:

$$\text{Cosine of angle of driver} = \frac{0.3491}{0.7854} = 0.44449 = \text{cosine}$$

of 63° 36′ nearly.

$90° - 63° 36' = 26° 24'$ = the helix angle of the follower.

$$\text{Lead of helix: Driver} = \frac{19.635}{\tan 63° 36'} = 9.7468 \text{ in}$$

$$\text{Lead of helix: Follower} = \frac{19.635}{\tan 26° 24'} = 39.555 \text{ in.}$$

The ratio may be checked by the following rule: "Divide lead of spiral of driving gear by the circumference of the pitch circle of the driven gear to get the revolutions of the follower."

$$\text{Then } \frac{9.7468}{19.635} = 0.4964 \text{ which is close enough to } \tfrac{1}{2} \text{ for the purpose.}$$

Large Hemispheres by Welding and Spinning

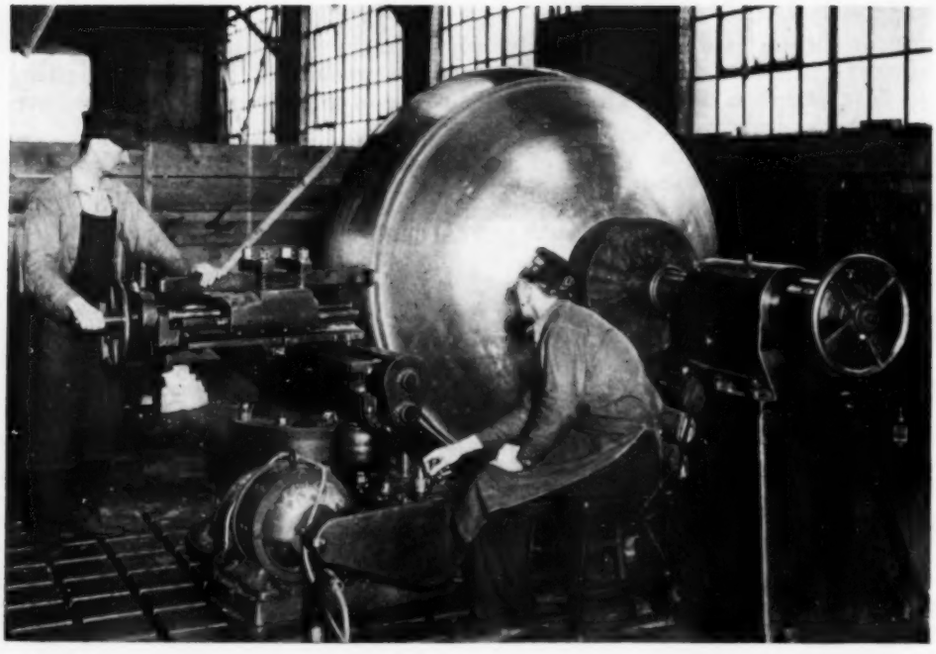
IN THE forming of large circular hollow ware, and especially where production is limited to a few pieces, the spinning process is generally employed. Briefly, it consists of rotating a metal blank at high speed in a lathe as it is pressed against a rotating chuck whose form the blank is to take. The spinning process is one of the oldest of the metal-working arts and is commonly used in the production of cooking utensils and other articles with reentrant angles.

The ability of commercially pure aluminum to flow and deform under pressure makes this metal well adapted to the spinning process. The size of articles produced in aluminum by this process varies from a few inches in diameter to 83½ in.

Recently, two hemispheres, 78½ in. in diameter and weighing 165 lb. each were made for the Carnegie Institution of Washington by the Aluminum Company of America, New Kensington, Pa., for use in some highly specialized scientific instruments. The hemispheres were spun from annealed commercially pure aluminum sheet, $\frac{3}{16}$ in. thick. Since lathe equipment was not available to accommodate a circle of sufficient size to produce the hemisphere from one piece of stock, it was necessary to spin a center section from a smaller diameter circle and weld to it formed sheet segments.

The center section was spun from a circle 83½ in. in diameter. Four segments, 24 in. by 70 in. were hand formed and welded into a continuous ring. This, in turn, was welded to the center section, and after all of the welds had been hammered and ground, the assembly was placed back in the lathe and spun to conform accurately to the 78½ in. diam.

After it has been respun, the hemisphere is ready to be finished and polished



A second spinning follows the welding of formed pieces to the center section

Approach Cuts for Milling and Hobbing —*Discussion*

PAUL R. FECHHEIMER
Engineer, The Karl Kiefer Machine Co.

THERE are several points in the Reference Book Sheet under the above title (*AM*—Vol. 76, page 157) with which I disagree. In the case of face or side milling, Mr. Herzog states that X (Fig. 1), the distance to be added to the length of the work to give the total cutter travel, is equal to the average of the approach cut and the overtravel, $(S + A) \div 2$. It can easily be seen in Fig. 1 that the approach cut is not to be considered, and that the overtravel must be added to the length of the work, except in the special case when the piece is so short that the approach cut is not finished before the back of the piece is completely milled, Fig. 2. In this case the overtravel is to be neglected, and the approach cut added to the length of the work; but in no case should the average of the two be added to give the correct travel.

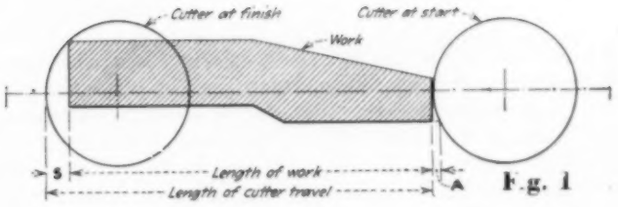


Fig. 1

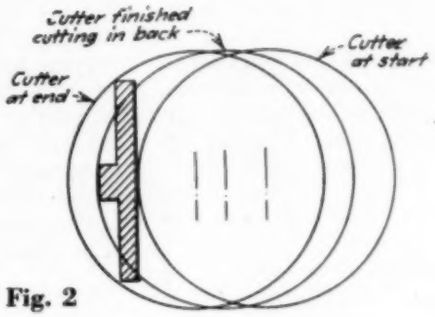


Fig. 2

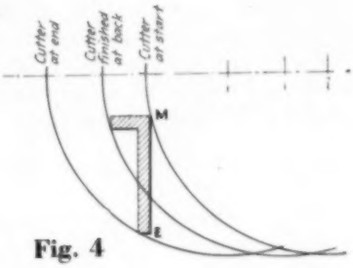


Fig. 4

The same thing is true when straddle milling. Mr. Herzog bases his calculation on T equalling the average width of cut at start and finish, Fig. 3. As can be seen, T should be equal to the vertical distance between point M and point V when V is below M. When V is above M, there is no extra travel to be added to the length of the work, except in the special case that the approach cut has not been completed when the cutter has finished milling in back, as in Fig. 4; in this case T should equal the vertical distance from M to E.

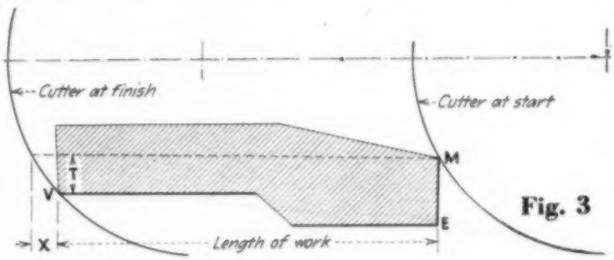


Fig. 3

In slab milling, the depth of cut at the end of cut has nothing to do with the case. D, therefore, should be the depth of cut at the start of the cut, and not the average depth at start and finish.

Mr. Herzog then states that in some side and face milling the cutter must pass completely over the work, and that in these cases the cutter diameter must be added to the results obtained from the charts. This, however, is incorrect because the extra travel can never exceed the diameter of the cutter, even when the cutter completely clears the work.

In Fig. 5 is a small chart which I have found advantageous in determining approach cuts. I believe it to be better than an alignment chart since it is simpler, more compact, requires no straight edge, and allows all cases to be solved on one chart. It is almost self-explanatory. Lay off the depth of cut, or whatever length the case may require, on either the ordinate or abscissa according to whichever is suitable. At the intersection of this length with the cutter circumference, the extra travel can be read directly. This figure added to the length of the work piece gives the total travel that will be needed to clean up the cut.

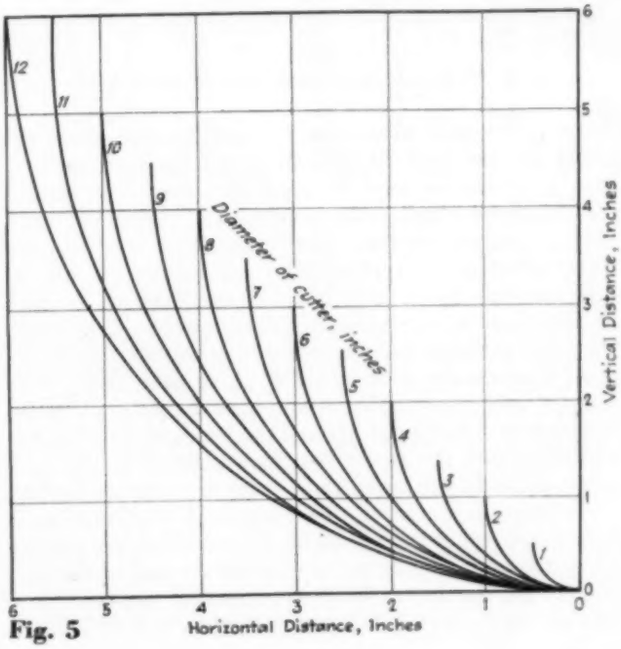


Fig. 5

Life Tests on V-Belts—*Discussion*

C. A. NORMAN
Professor of Machine Design, Ohio State University

IN VIEW of the fact that the V-belt is a somewhat new product, not yet quite standardized in make-up and use, it is imperative that in articles about it particular pains should be taken to avoid creating misconceptions about its properties and mode of application. The writer's attention has been called to the fact that in his article (*AM*—Vol. 76, page 605) two statements need modification or amplification if wrong interpretations are to be avoided.

The first refers to the advice to use in designs the largest pulley diameter demanded to secure reasonable life with any V-belt readily available in the market. It should of course be understood that when economy of material, or lack of space, or any other consideration

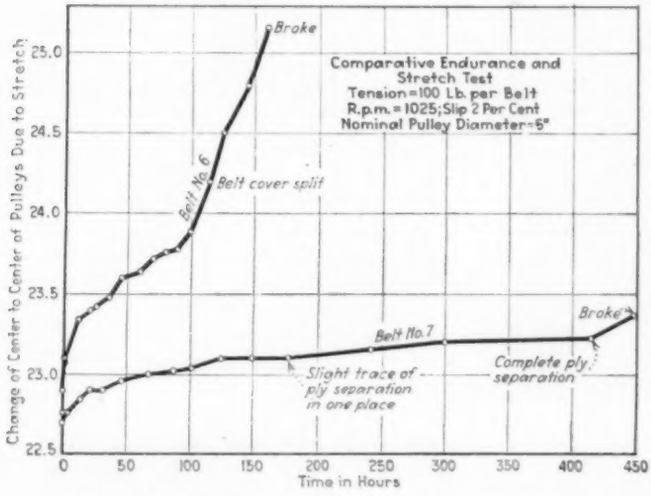


Fig. 1—Endurance and stretch tests of two V-belts

makes it desirable to use pulleys smaller than those required for the least flexible and least durable types of belts, it should be kept in mind that there are readily available belts which make this possible. Thus in Fig. 1 there are plotted the endurance test records for two belts run on the writer's type of testing machine. It will be seen that one has a life almost three times as long as the other and a very much smaller stretch. The difference is so striking that there would seem to be little excuse for using the poorer belt at all, or designing for it, unless a very considerable saving in first cost can thereby be effected. The longer life and the lessened need for adjustments with the better belt may mean a money saving in the long run, even though its first cost be higher.

The second statement that may need amplification is the one regarding the possibility of using beginning failure of the wrapping as a criterion for the end of the useful life of the belt. This statement of course refers only to the type of belt tested. In this type of belt the cords are arranged somewhat as a central core within a series of several wrappings, these latter forming an important part of the section. No, or little, attempt is made to arrange the cords as a flat zone or ribbon at or near the neutral axis of the belt with a yielding tension member above and a yielding compression member below so as to avoid unequal stretching of the cords and internal wear and disarrangement of the parts generally. In the latter type of belt, i.e., in belts with parts so arranged, no wrapping may be used in the construction at all, or if it is used, it may form such an unimportant and subordinate part of the section that the belt may run for a long time after the wrapping has worn through.

The better belt in Fig. 1 is a representative of this type. It manifestly would be absurd in belts of this type to regard beginning failure of the wrapping as the end of the useful life of the belt.

Cold Molding Revived

HERBERT CHASE

WHEN SOME of the basic patents on the manufacture of the phenolic resins expired and the price of the raw materials was much reduced, some molders thought that the fate of cold molded materials using asphaltic binders might be sealed. This was based partly upon the conclusion that, although the raw phenolic resins would still cost more than the cold molded mixtures, the greater reliability of the phenolic type would offset the slight difference in cost. This conclusion, however, did not take into consideration certain possibilities, and to some extent overlooked some important factors that control the cost of molding work.

What happened is this: Improved technique, involving exacting control of the conditions that govern the relative strength or brittleness of cold molded articles, has eliminated the uncertainties of the process and assured a uniformly high quality product. With this settled, for certain classes of articles that would be satisfactory both electrically and mechanically whether made from one or the other type of material, the problem was then largely one of production costs. This in turn involves first the cost of the mold itself, second the rate of molding, and third the number of pieces to be molded.

The net result, in at least one plant where both types of molding are done, is that both processes are used extensively. Parts required in relatively small quantities are cold-molded because a single-cavity, relatively inexpensive mold is needed and the time per piece in the mold is only a few seconds. Where large quantities are needed and a multiple-cavity mold is justified as to cost, phenolic materials are used.

IDEAS FROM PRACTICAL MEN

A Milling Fixture for the Lathe

JOHN J. MC HENRY

In making dies for deep-drawn shells having either straight or bullet-shaped sides, it is frequently required to cut grooves of various shapes either for ornament or reinforcement, such as is indicated in Fig. 1. We have usually made the dies in sections, cutting the grooves half in each section, and inclosed the assembly in a ring. While this has been satisfactory, though quite expensive, we have found ourselves up against shapes that did not lend themselves to a construction of this type.

To overcome this difficulty, we made a device for milling the grooves in the lathe. It has proved to be not only a time saver for the work mentioned, but a useful complement to our machine equipment. The device consists of a speed-reducing unit with a motor; a milling fixture; a holder for the milling fixture, together with a motor and its support; and a faceplate attachment either for accurately locating the work or for feeding it for a circular cut. The faceplate attachment is shown in Fig. 2 and is clamped to the lathe bed by the special clamp to be seen at the bottom. The change gears are removed and the lead screw is driven by belt from a motor - driven speed reducer to give a carriage feed.

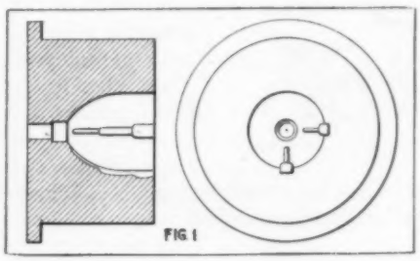
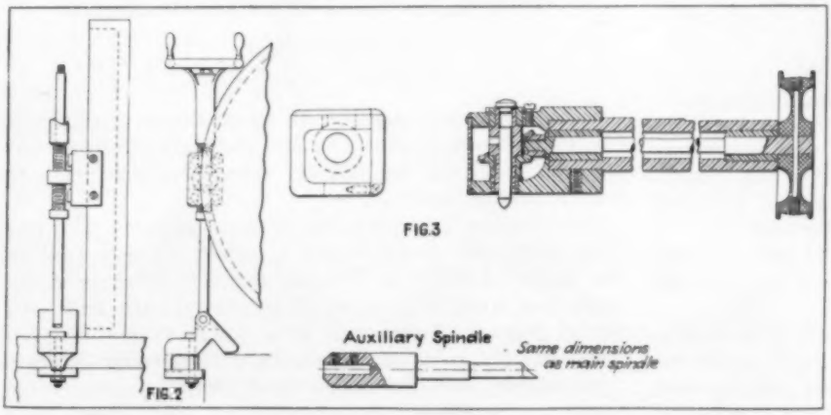


FIG 1

The milling attachment, shown in Fig. 3, is held by its round body in the holder attached to the carriage, and is driven by a motor (not shown). Two interchangeable spindles are carried by the attachment, the auxiliary spindle permitting the use of a cutter at the bottom of a conical shape. When this spindle is required, it is usually because of lack of space and proportionately smaller recesses or grooves to be machined. Consequently, the cutter head has a 2-to-1 ratio, reducing the speed for the larger cutters used on the main spindle. In the end view in Fig. 3, the housing of the cutter head is shown with all parts removed excepting the side plate.



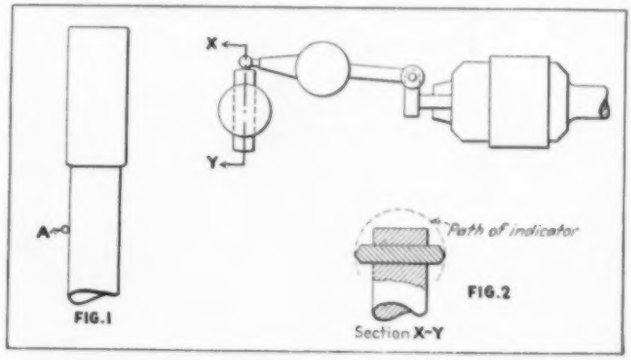
Locating a Cross Hole—*Discussion*

FRANK A. GABRIEL

In Clifford H. French's article under the title above (*AM*—Vol. 76, page 504), it seems that either certain points are not made clear or else the method is at fault; therefore I have the following comments and suggestions to offer:

How was the indicator brought half-way around? The uppermost part of the plug would prevent the indicator from describing a half circle (see Fig. 1 in which the indicator ball is represented at *A*). If the saddle were brought far enough back for the indicator to clear the plug while the indicator was turned half a revolution and then moved in again to its original position, I would say that it was an uncertain method and one that required too many movements.

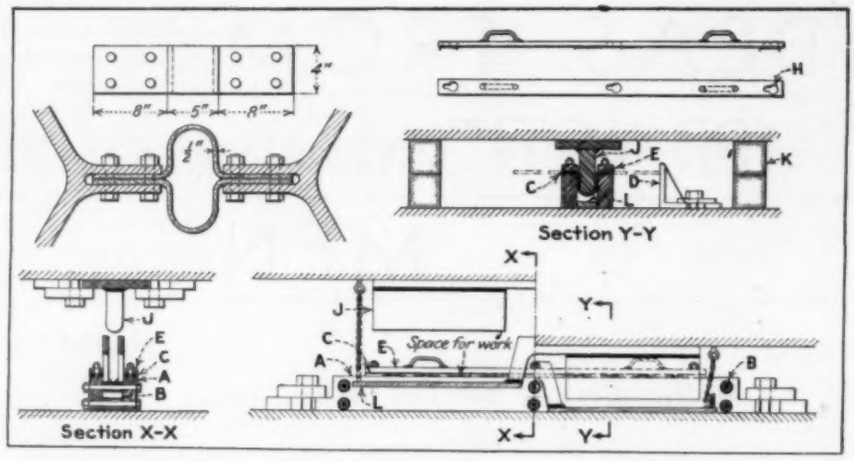
Furthermore, Mr. French does not explain how it was determined that the indicator had made exactly half a revolution so as to be at diametrically opposite points of the plug body. I have been confronted with work that required location from a plug in a vertical position and arrived at the desired result by the following method:



After the plug had been rough turned, it was drilled radially through the part usually intended for the handle. In this hole was driven a pin, the ends of which were ground to the shape shown in the section *X-Y*, Fig. 2. Both ends of the pin were then equi-distant from the center of the plug. The body of the plug was then ground to fit the hole in the work and was placed therein.

To locate for the cross hole, the work was moved by moving the table until the indicator ball was in contact with one end of the pin. In this

position a reading was taken. The spindle was then turned half a revolution, bringing the indicator ball into contact with the opposite end of the pin. Another reading was taken, and if both readings were the same, the spindle was in line, crosswise, with the center of the hole in the work. If the readings were not the same the table was moved approximately half of the difference and other readings were taken from both ends of the pin until the readings were the same.



Having centered the pin, it remained only to move the table at a right angle to the movement made in adjustment until the work cleared the chuck enough to permit removal of the indicator and the insertion of a drill in its place. The knee could then be adjusted to bring the work to the correct height. This done, the drilling could proceed with the assurance that the axis of the hole would cross that of the hole already drilled at a right angle.

Since the ends of the pin were ground while the plug was on centers, and were of the shape shown in the section *X-Y*, Fig. 2, it was not necessary that the indicator should make a half revolution exactly; it should make enough more than half a revolution to carry the ball past the high points on the ends of the pin.

I would say that the plug shown in Mr. French's illustration is decidedly too long. A plug as short as is possible would aid in assuring a more accurate location for the cross hole.

Utilizing the Work-Hardening Properties of Copper

EMIL WITTMAN
General Electric Company, Philadelphia Plant

We had an order to make 3,000 pair of expansion bands of ½-in. copper, like the ones shown in the upper left-hand corner of the illustration. The bands were to be set in pairs between the flanges of electrical conductors and were to act as expansion joints. Hard copper was specified in the order. Since soft copper work-hardens by bending, and since the bands were required to be hard in the exposed parts only, we used soft copper, knowing that it would be hardened by working.

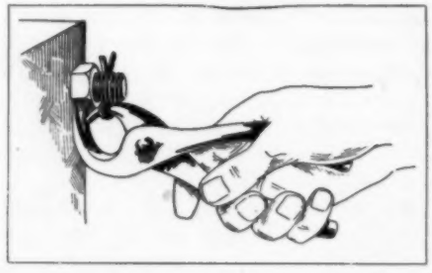
In accordance with the production required, the bending fixture illustrated was made, being used in a hydraulic press. In operation, eight pieces of copper, lubricated with lard oil, were put on top of the jaws *A*, which are kept apart by the distance pipes *B* and tied by bolts. The stock is located sidewise by the spacers *C* and lengthwise by the angle plate *D*. On each jaw, on top of the spacers are the straps *E*, to which the stock is clamped. Handles facilitate placing the straps, and the "buttonholes" *H* permit their removal without taking off the nuts. As the ram descends, the punch *J* draws the stock between the jaws, forming and work-hardening it.

As soon as the ram strikes the abutments *K*, its movement is reversed until the work is stripped from the punch by the straps *E*. At this position, the upward movement of the ram is interrupted for the removal of the straps. When the ram is permitted to resume its upward movement, it lifts the ejector *L* by means of chains attached to both ends. As soon as the work is lifted free by the ejector, the upward movement of the ram is stopped and the work is taken from the fixture.

Tool for Removing Cotter Pins

D. W. PATTON
Electrician, Indiana Electric Company

Mechanics whose daily jobs require the removal of many cotter pins can save much time by the use of the handy tool shown in the illustration. While not available commercially, it can be made in a short time by any good blacksmith. The one I have was designed by me and was made in the forge shop of the works in which I am employed. The sketch is self explanatory, as from it both the use and the construction of the tool can be understood readily. There is no patent on it, and anyone is welcome to use the idea.

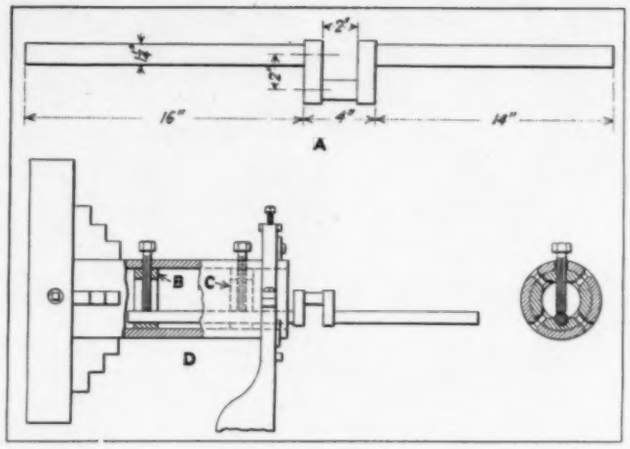


Turning Single-Throw Crankshafts

P. OPPUYSEN
Guadalajara, Jalisco, Mexico

I had to turn a quantity of single-throw crankshafts like that shown at *A*. The straight parts were turned on centers in the usual way, using the steadyrest to prevent undue spring.

For turning the crankpins, a short piece of pipe was fitted with two rings *B* and *C* which were riveted to the inside of the pipe. Before placing the rings in the pipe, they were held in the chuck eccentrically and half-round grooves of the same diameter as that of the finished straight parts of the crankshafts were cut in them by a boring tool, the eccentricity of the grooves being equal to the throw of the crankpin. The rings were



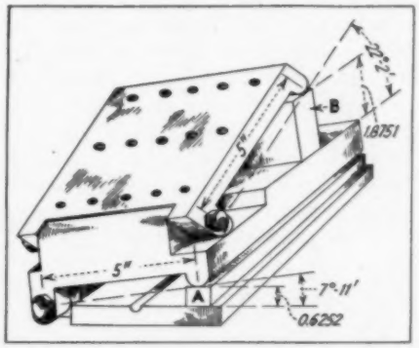
riveted in the pipe with these grooves in line, making seats for the straight parts of the crankshafts.

With one end of the pipe held in the chuck and the other end in the steadyrest, one end of a crankshaft was laid in the half-round grooves and held lightly by setscrews, as at *D*. After rotating the crankshaft until the crankpin ran approximately true, the setscrews were tightened, holding the shaft firmly in position. It was then an easy matter to turn the crankpin.

A Combination Sine Plate

EDWARD LAY

The double sine plate shown is used in grinding single and compound angles on tools for screw machines, threading tools and machine parts. The settings for the required angles are quickly made by blocks such as those at *A* and *B*. Since the centers of the contact points are 5 in. from the centers of the pivots, the heights of the blocks for all angles are one-half of those given in the tables of constants for 10-in. sine bars.

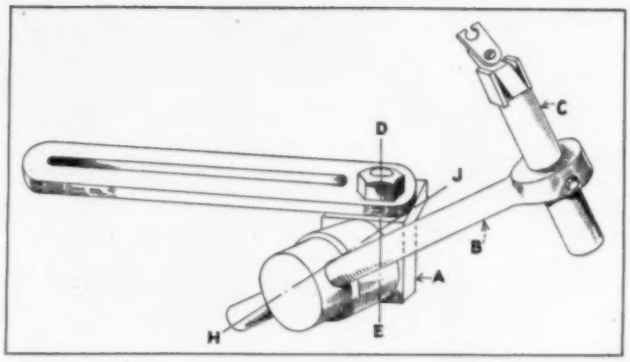


The construction is simple and rigid, the device consisting of the base, two pivoted sine plates and the combined clamping and pivot screws. The upper plate has a number of tapped holes to accommodate the screws for work-holding clamps.

An Attachment for the Cutter Grinder

JOHN H. CURTIS

Recently I had to sharpen a cutter of a type that was new to me. In setting up for the job, I found myself in a fix because I could not get the tooth rest under the proper tooth. I wasted some time on the job and then concluded to take my problem home with me, as there was no particular hurry for the cutter.



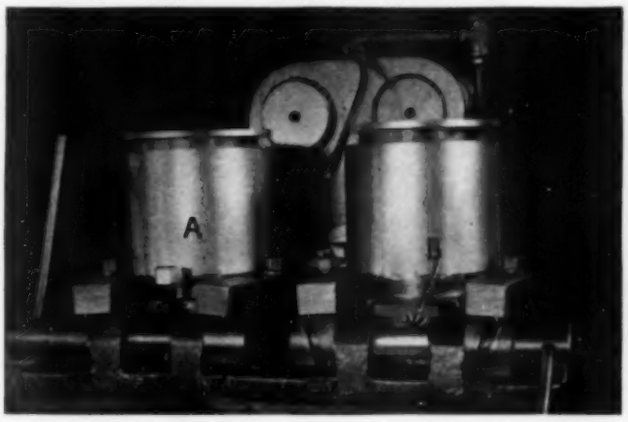
After supper I found a solution, the simple little angle bracket *A*. I had it made and attached it to the No. 1½-in. Cincinnati cutter grinder that I was using. It worked like a charm; in fact I would not be without it.

When the bracket was attached as shown, the arm *B* carrying the tooth-rest holder *C* could be swung through an arc of about 280 deg. on axis *D-E*, while on axis *H-J* it could revolve 360 deg., making a universal holder.

Cam Controlled Clamping Fixture

HERBERT F. CRAWFORD

A quick-acting, cam-controlled fixture is used for milling the flats on the sides of the cylinder flanges in the plant of the Kinner Motors Company, Glendale, Calif. The clamp at the left is shown open and does not show the cam slots. These are, however, shown at the right. The first flat is milled at the left, the

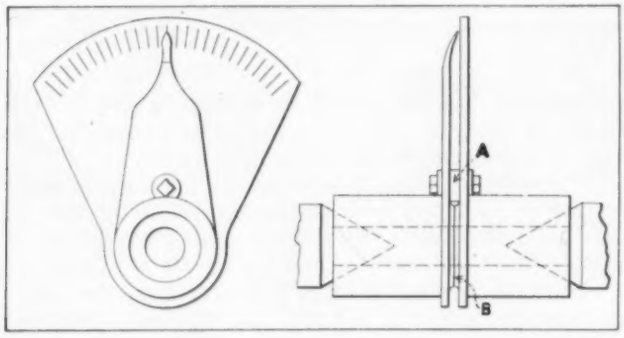


clamps gripping the cylinder in the neck above the flange. After the first side is milled at *A* the cylinder goes to the clamp at the right, the flat of the flange being located against the stop *B*. The clamping arms are so shaped that they draw the cylinder back against this stop and so insure both sides being parallel. By making the cam portion of the shaft eccentric with the high part toward the end of the cam slot, the clamps not only draw the cylinder against the stop but also exert a downward pressure on the flange.

Device for Aligning Lathe Centers
Discussion

R. G. HEWITT
Keighley, England

I was interested in the ingenious device described by Mark L. Gluckman in an article under the title above (*AM*—Vol. 76, page 308), but I think it would be improved if made as here shown. It could then be used not only for aligning the centers, but also for setting the



tailstock center for turning tapers. The zero mark is obtained by placing the bushings on a mandrel to bring them into correct alignment.

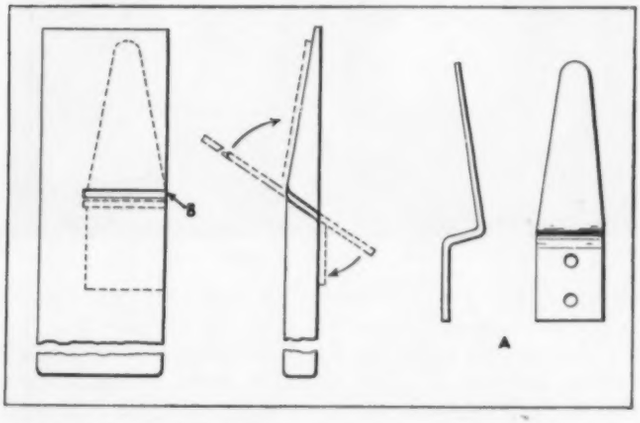
A further improvement is reduction of the area of contact faces of the components, the only points of contact being the bosses *A* and *B*, thus rendering the device more sensitive to any misalignment of the centers and increasing its efficiency.

Bending Flat Springs

A. OUTWATER
Superintendent, R. N. Brodie Company

A short time ago it was necessary for us to bend several hundred flat bronze springs to the shape indicated at *A*. While the work was an ideal job for the press, the quantity would not warrant the cost of a die.

A saw kerf was cut partly through the width of a



piece of flat, ¼x1x4-in. cold-rolled steel, the length of the kerf being equal to the width of the springs, as indicated at *B*. One end of the steel piece was beveled at angle slightly greater than that of the finished spring, to allow for the spring-back of the metal after bending.

The springs were entered in the kerf and both ends were bent by hand and then lightly tapped with a hammer to set them. The desired results were obtained at a minimum of cost, and with surprising rapidity.

A Device for Undercutting

DANIEL DOOLITTLE WELLS

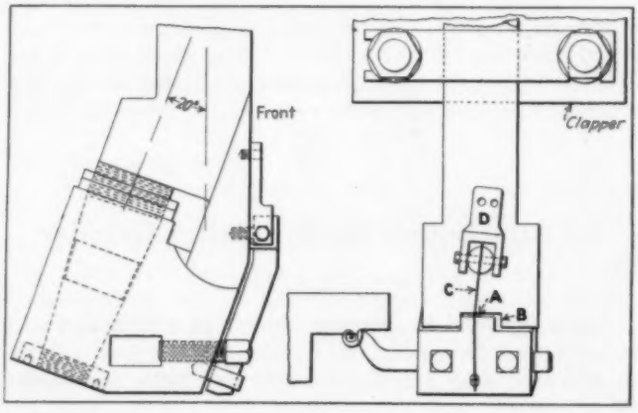
In planing the underside of work in the ordinary manner it is necessary either to fasten the clapper to prevent the tool from rising on the return stroke, or to raise the clapper by hand at the end of the cutting stroke high enough for the tool to clear the work.

The device illustrated automatically clears the tool from the work on the return stroke by a rotative movement of the toolholder, acting as a sort of rotating clapper. The shank terminates in a tapered spindle that inclines rearward at an angle of 20 deg. from the vertical. The toolholder proper is fitted to this spindle and can rotate slightly upon it, its movement being limited by the difference in width of the lug *A* on the holder and the slot *B* in the lower part of the shank. When the planer is on the return stroke, the flat spring *C* keeps the lug toward the proper side of the slot.

In operation, the regular clapper is clamped down to prevent it from lifting. As soon as the back of the tool contacts with the work on the return stroke, its drag rotates the holder on the spindle against pressure of the flat spring. Since the spindle is at an angle of 20 deg. from the vertical, slight rotative movement of the holder causes the point of the tool to assume a lower point than when cutting, and it is thus released from positive contact with the work on the return stroke. While it is true that the tool is held against the work on the return stroke by the pressure of the flat spring, the action is the same as that of a tool in the clapper when operating on the upper surface of the work.

When the tool is entirely clear of the work at the completion of the return stroke, the spring returns the holder to its original position, the point of the tool being raised and ready to cut as soon as the forward stroke begins. The tool can be inserted in the holder from either side, converting it into either a right- or a left-hand tool, the only change necessary in the device being to move the pin at the top of the spring holder *D* from one hole to the other and swivel the spring holder until the pin will engage the hole in the shank.

In addition to undercutting, the device can be used for vertical planing without the necessity for setting the clapper box at an angle for tool clearance.



American Machinist

Reference Book Sheet

LUBRICATION OF BALL BEARINGS

PRINCIPLES involved in the lubrication of ball bearings differ radically from the fundamentals governing in the case of plain or sleeve bearings. The high unit pressures existing between the balls and races when under load prohibit the formation of an unbroken film of oil, and the journal load, therefore, is directly supported by the balls and races, which are in metal-to-metal rolling contact. Contact between the balls and their spacing member produces sliding rather than rolling friction, and lubrication is required at these points. Chief duties of a ball-bearing lubricant are:

1. To provide a tenuous lubricating film between balls and separator pockets.

2. To dissipate heat caused by deformation of load-carrying members.

3. To prevent corrosion or rust of the bearing parts.

4. To aid in protecting the bearing against dirt, water, acid fumes or foreign matter.

In general, either an oil or a grease may be used for ball bearing lubrication. Where an economical means of supplying oil to the bearing can be used, and where a slight leakage past the bearing closure is not detrimental, oil may be considered the most desirable lubricant. However, where a minimum of attention to lubrication is the essential requirement, the use of grease is indicated.

Oils

Only pure mineral oils should be used. In deciding upon the type and viscosity of the oil to be used, the first consideration should be the operating temperature. It is unnecessary to have as great a number of specifications as for plain bearings, hence the lubricant recommendation can be divided into two major ranges of operating temperature and five speed ranges, as in the accompanying table.

* Speed R.P.M.	Bearing Series	Bearing Bore Size		OPERATING TEMPERATURE				
				32° to 150° F.			150° to 200° F.	
		Grease	Oil	Moisture Present		No Moisture	Moisture Present	No Moisture
Up to 500	Light	0 to 22	ALL SIZES	Oil	400-500 Sec. Visc. @ 100° F. †	400-500 Sec. Visc. @ 100° F.	500-600 Sec. Visc. @ 100° F. †	500-600 Sec. Visc. @ 100° F.
	Med.	0 to 22		Grease	CALCIUM 12-14% Soap Oil as Above	SODIUM 12-14% Soap Oil as Above		SODIUM 18-20% Soap Oil as Above
500 to 2000	Light	0 to 18		Oil	400-500 Sec. Visc. @ 100° F. †	400-500 Sec. Visc. @ 100° F.	500-600 Sec. Visc. @ 100° F. †	500-600 Sec. Visc. @ 100° F.
	Med.	0 to 16		Grease	CALCIUM 12-14% Soap Oil as Above	SODIUM 12-14% Soap Oil as Above		SODIUM 18-20% Soap Oil as Above
2000 to 5000	Light	0 to 10		Oil	300-400 Sec. Visc. @ 100° F. †	300-400 Sec. Visc. @ 100° F.	400-500 Sec. Visc. @ 100° F. †	400-500 Sec. Visc. @ 100° F.
	Med.	0 to 9		Grease	CALCIUM 12-14% Soap Oil as Above	SODIUM 12-14% Soap Oil as Above		SODIUM 18-20% Soap Oil as Above
5000 to to 10,000	Light	0 to 6		Oil	200-300 Sec. Visc. @ 100° F. †	200-300 Sec. Visc. @ 100° F.	300-400 Sec. Visc. @ 100° F. †	300-400 Sec. Visc. @ 100° F.
	Med.	0 to 5		Grease		SODIUM 12-14% Soap Oil as Above		SODIUM 18-20% Soap Oil as Above
Above 10,000	Light	0 to 4		Oil	100-150 Sec. Visc. @ 100° F. †	100-150 Sec. Visc. @ 100° F.	200-300 Sec. Visc. @ 100° F. †	200-300 Sec. Visc. @ 100° F.
	Med.	0 to 3		Grease		SODIUM 12-15% Soap Oil as Above		SODIUM 18-20% Soap Oil as Above

* Limiting bearing speed based on ball surface speed of approximately 3000 feet per minute.

† Oils used should not readily emulsify with water.

Grease must be of smooth texture — not of fibrous nature.

Note: Specifications in the above table are for general guidance. Commercial lubricants, which vary slightly from these specifications, should give satisfactory results.

Potassium base greases of similar specifications may be used where sodium grease is specified above.

Greases

Only two kinds of grease are used for ball bearings, one having a calcium soap base and the other either a sodium or potassium base, or a combination of the latter two. Fundamental differences are that sodium or potassium greases are water soluble whereas calcium greases are insoluble. The former have greater stability, being affected much less by agitation or by temperature changes than calcium greases.

When using oil, the method of application depends upon the surface speed of the balls, which is a better index of the lubricating method required than shaft speed, since bearings of two or more different sizes may be applied where the shaft speeds are the same. Where ball speeds are low, the quantity of oil present is of comparatively little importance, but as speeds increase, fluid friction, due to churning, must be avoided by reducing the quantity of lubricant until, at very high speeds, only a mist of oil is desirable. To prevent rise in temperature, it is necessary that adequate drainage of oil from the bearing housing be provided.

Where ball surface speeds are moderate, the common practice is to fill the bearing housing approximately level with the lowest point of the bearing inner ring. The desired level may be obtained by a wick-feed oil cup or splash lubrication.

Where ball surface speeds are high, oil may be fed in drops from sight-feed oilers, drains being provided. With much increase in ball speeds, the amount of oil fed to the bearings must be definitely controlled, especially when the bearings are in a vertical position. Special designs, wick feeds and circulating systems have been worked out.

In designing closures for grease lubrication, it should be remembered that the grease will be thrown away from the rotating members by centrifugal force. Therefore, the closure design must be such that the lubricant will be held in close proximity to the separator and balls, but an adequate volume of grease must be supplied. Failure of grease lubrication can only occur from:

1. Too large a space around the bearing.

2. Loss of grease due to closure not retaining it.

3. Rapid evaporation or oxidation of lubricant due to a high operating temperature and inadequate quantity.

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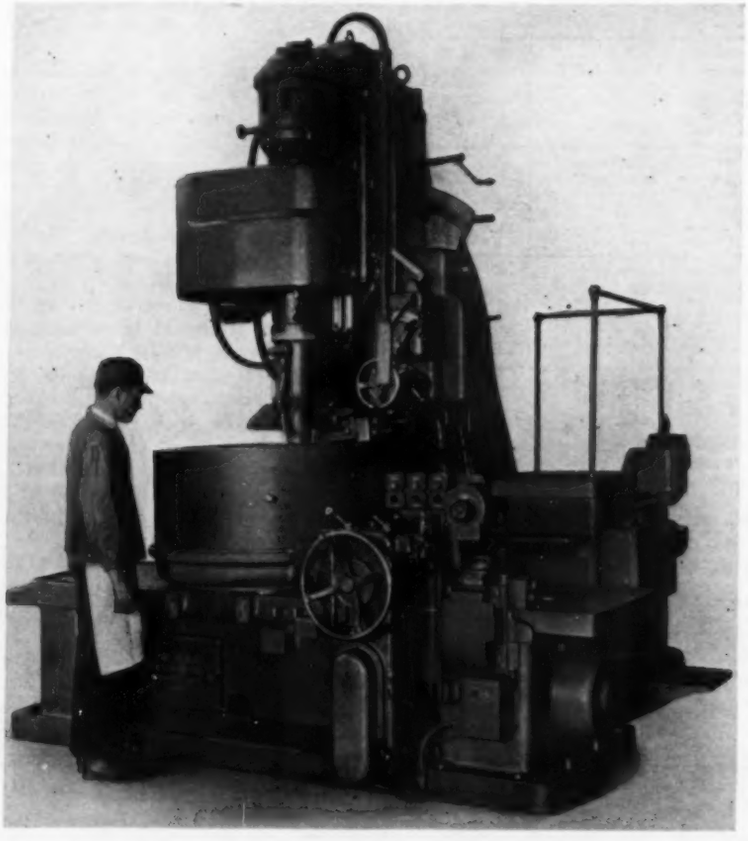
Heald No. 90 Vertical Internal Grinder

Large work which it is desirable to grind in a vertical position rather than horizontal, particularly where the part is awkward to handle or there is much overhang, is the field of the No. 90 heavy-duty vertical internal grinder announced by the Heald Machine Co., Worcester, Mass. This machine will grind straight or taper, internally or externally, as well as face grind.

Drive to the wheelhead can be furnished in two ways. That shown is through the company's usual idler pulley arrangement and is necessary where considerable range of spindle speeds is required. Usually on large, heavy-duty spindles with larger wheels, the wheelhead would be directly coupled to the motor, and the idler and belt arrangement would be eliminated. The vertical wheelhead slide is operated hydraulically and controlled from the reverse control valve arrangement at the right of the head. The slide is arranged with an elevator lock arrangement which latches into the slide to stop the spindle from falling when the hydraulic system is shut off with the machine idle. Movement of the slide is controlled from a throttle valve lever and is reversed by a reverse lever. The slide also has a hand feed. This hand feed is thrown in and out by moving another lever. The wheelhead slide on a standard machine may be set up to 15 degrees on the side or 30 degrees included angle. The graduated plate is at a large radius, and reads with a vernier to two minutes of angularity.



The entire vertical slide is also counterbalanced hydraulically by an arrangement of valves. Stroke is set by two dogs, and to bring the wheel out of the grinding position a lever arrangement operates a lift latch on the lower dog. This counterbalancing arrangement gives uniform speed up or down at any particular throttle opening, and also equalizes the hand effort required to move the slide up or down.

A 25-hp. motor is mounted on the wheel-slide for driving the wheel and furnishes ample power for heavy work. The hydraulic system is operated from an independent motor driving the pump located on the lower right-hand side of the column. The vertical slide is lubricated automatically by a pump which forces oil to the proper level and then lets it feed to the proper surfaces by gravity.

The machine illustrated is the 36-in. size and is shown with a 36-in. faceplate. It may be furnished in two general sizes, namely 36 and 48 in. Each of these machines has five different standard heights of column, giving a clearance of 15, 18, 24 and 38 in. between the diamond and the faceplate. Also, either one of the machines may be furnished with either a 22 or 31 in. grinding stroke. On the 15 and 18 in heights, probably only the 22 in. stroke would be necessary, because the wheel can be brought down against the top of the faceplate. However, on the 24, 30 and 38 in. heights, the 31 in. stroke would be the more common.

The chuck driving shaft is driven by a Texrope drive, taking power from a 5-hp. variable speed d.c. motor at the right of the base. The chuck is oiled by force-feed lubrication and has its own separate pump and oil tank under the table, thus affording a self-contained lubricating arrangement which travels back and forth with the chuck. Worm gear drive is provided for the chuck, but the spindle is in two sections, so that the chuck itself merely floats on the top bearing instead of being directly connected to the drive, as has been the

previous arrangement on No. 25-A rotary surface grinder. A floating coupling is used between the two spindles.

The machine is illustrated with the table in the grinding position, but for loading the table is moved several feet to the left so that a crane may be used to load and unload the work. The table is operated automatically from a small motor in the inclosure on the base directly below the hand wheel. When equipped for production work, the machine carries a dial indicator for size control. This dial indicator, while carried by the base and reading directly on the table movement, is compensated at each dressing of the wheel. In this way, the indicator reads the relation of the wheel surface with the table or work, rather than that of base and table. Therefore, if the wheel is dressed for finishing and light cuts are taken for the finishing to avoid wheelhead spring, a modified "Sizematic" control of size is secured. A limit switch, carried by the compensated dial indicator bracket, automatically repositions the work in relation to the wheel at each return from the loading position. After loading, the table is brought back into the approximate grinding position by rapid traverse, at which time the wheel is dropped into grinding position and the feeds engage. To bring the wheel in contact with the work, the same means of operating the hand wheel as on the automatic internal grinder are used.

Grinding is done on the right side of the hole when facing the machine, and there is an interlock which prevents the rapid traverse being engaged during the grinding operation and disengages the hand feed wheel during the rapid traverse.

Hydraulic Feed

Table feed is hydraulic and works as the wheel reciprocates up and down. It can be made to feed at each end of the stroke or at one end of the stroke. Two small levers on the top of the handwheel box control the amount of feed when grinding. The machine is suitable for grinding internal and external surfaces, as the feed of the table is toward the left for the grinding of holes and toward the right for the grinding of the outside diameter. So that both feeds cannot be engaged at the same time, an interlock is provided which only permits one lever to be engaged at a time. It is possible to face grind with a cup wheel at the same setting of the piece, so that, if necessary, it is possible to grind the bore, O. D. and face, so that all surfaces will be true with each other. The grinding of the O. D. is done with the wheel to the right of the work. The chuck itself may be run in the reverse direction when grinding the O. D.

The No. 90 internal grinder, 36 in. size, weighs approximately 15 tons, is 12 ft. high and requires floor space of 12 x 9 ft.

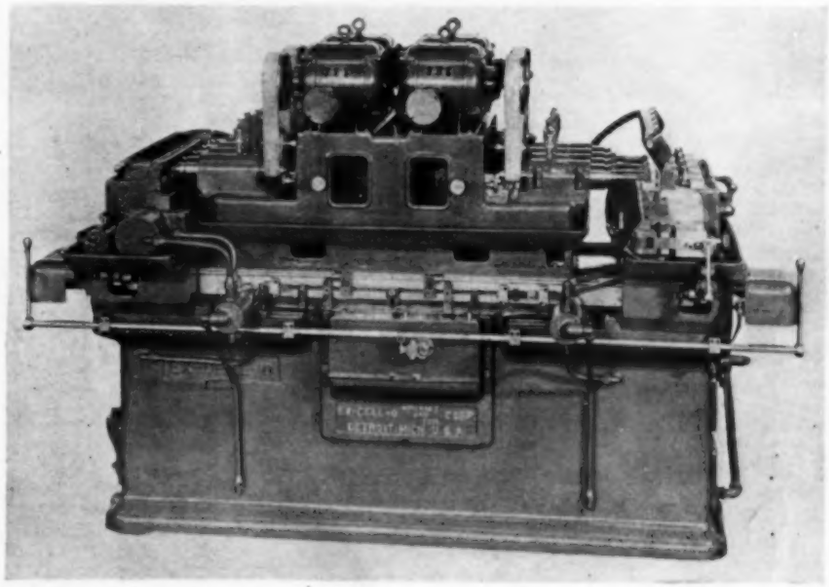
Ex-Cell-O Precision Grinder for Connecting Rods

Further development of the features of its precision boring machine have enabled the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich., to design a precision grinder for connecting rods. By replacing individual motor-driven boring units with internal grinding spindles and suitable holding fixtures, this high production grinder was made available for grinding the relief on each side of the inside diameter in the large end of the connecting rod. Two banks of four internal grinding spindles are mounted on each end of the unit base, which, in turn, is mounted on the fixture table. Four motors are mounted above and between the two banks of spindles, each motor driving two grinding spindles by belts.

At each end of the machine is mounted a full hydraulic fixture for mounting four rods during the grinding operation. These fixtures are mounted rigidly on the bridge rails of the base and are indexed from side to side hydraulically. Length of the indexing stroke from side to side is adjusted by turning the hand-knob at the side of each fixture.

A rotary valve is mounted on the front of the machine and in front of each fixture to control the operating cycle of that fixture. By adjusting the differential sliding dog at each end of the table, the rotary valve will make the table take the number of strokes required to grind the relief on one side of the rod. The fixture then indexes automatically across so that an equal number of strokes are taken to grind the corresponding relief on the opposite side of the inside diameter. These reliefs must have the same depth and be 180 degrees apart.

As the operation is completed, the table bearing the motors and internal grinding spindles returns to the center and stops. Before starting it in the opposite direction, the operator must pull the control lever which extends the full length of the machine and has a control handle near each fixture. This insures that the operator has unloaded the finished rod, replaced them with new rods and is ready for the next cycle.



Automatic wheel dressing is provided for each wheel. The wheels must pass the dressers before entering the work, and upon the completion of the cycle at each end of the machine they return on the dresser side, which keeps each wheel dressed to size.

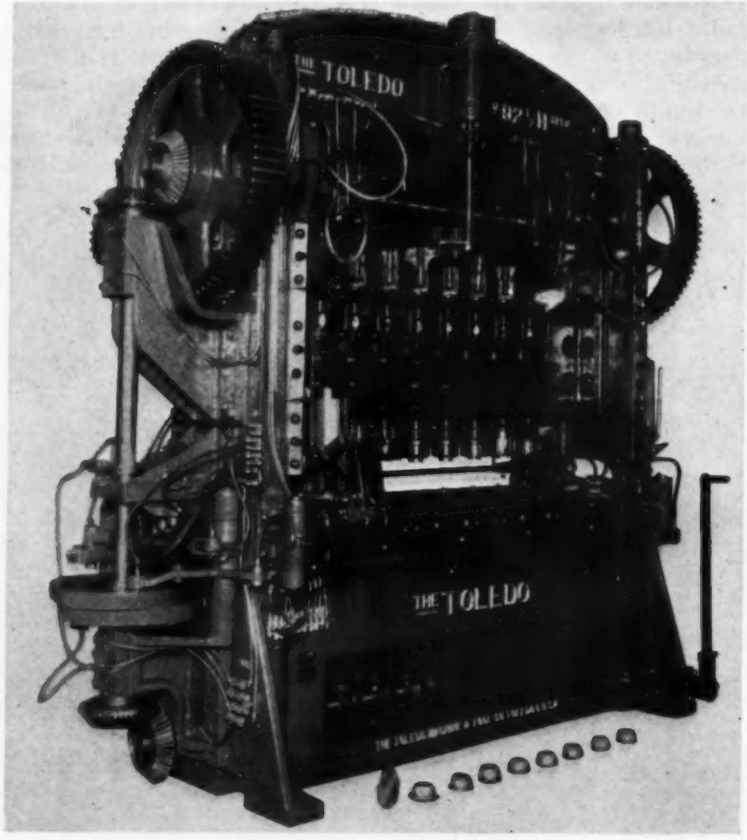
The internal grinding spindles used on this machine are standard Ex-Cell-O single-body spindles provided with suitable solid projections on which are mounted the grinding wheels. The mounting brackets for holding the spindles are also of standard design. The same base, table and hydraulic system are used on the above machine as on the Style 216A precision boring machine recently described.

Toledo Double-Crank Press with Automatic Feed

A special automatic press developed by the Toledo Machine & Tool Co., Toledo, Ohio, is in reality eight independent presses mounted in one frame with an automatic mechanism that eliminates intermediate handling between the several independent operations required to finish the piece. The press will produce thirty complete pieces per minute and has a capacity of 240 actual operations per minute. The piece produced is a special conical shaped shell of No. 24 gage stainless steel. The blank is 6¼ in. in diameter. The piece has numerous holes, bosses, and flanges in the bottom. The press, however, is adapted to a large variety of similar work such as wheel hub covers, reflectors, lamp and lantern bodies and parts, kettle breasts, milk separator shells, and similar articles.

After the blanks have been stacked in the tube feed at the left of the bed, the hand lever at the right is thrown in to operate a multiple-disk friction clutch. With the clutch engaged the feed pushes the blanks into the first-operation forming die. The shell is ejected from the die by a positive knock-out in the punch, and a cam-actuated knock-out in the bed. At this point the shell is caught by the fingers of a so-called "cut and carry" feed, by which it is carried successively under the several punches until it has been finally completed and discharged at the chute at the back right-hand part of the bed.

The press is of the double-crank type with twin gears on the crankshaft. Distance between the uprights is 84 in. Each of the eight punch slides is individually adjusted, and counterbalanced by a pair of air cylinders to assure smooth running. A special lubrication system is provided. In addition to the cam-actuated knock-out in the bed there is also a pressure attachment for operating the draw ring. Total weight of the press is about 45,000 lb., and it is driven by a direct-geared 15-hp. motor.



Ryerson 18-8 Welding Electrode

An Allegheny Metal welding electrode has been announced by Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts., Chicago, Ill. The rod is applicable to Allegheny Metal and other stainless steels in the 18-8 chrome-nickel group. The special flux coating produces a non-active gas which surrounds the hot metal and prevents the oxygen of the air from attacking the metal and forming oxides. The heavy slag formed on top of the weld acts as a protective agent as the metal cools. When welding with the electrode, it is unnecessary to remove the slag before the next bead is laid down. Tests indicate carbon increase in the bead of about 0.01 per cent as compared to the original rod. Thus, the corrosion resistance of the deposited metal remains equal to that of the parent metal, and the weld is soft enough for machining.

Brown & Sharpe Micrometer Calipers with T. C. Measuring Surfaces

The Brown & Sharpe Manufacturing Co., Providence, R. I., has announced the inclusion in its line of 1-in. micrometer calipers in several styles having the ends of the spindle and anvil faced with tungsten carbide. The calipers so furnished include 16 different styles. These represent the inexpensive black-frame style, the

conventional bright-finish, U-shape frame micrometer, with or without clamp ring, and micrometers for measuring in thousandths or ten-thousandths. The tungsten-carbide measuring surfaces are especially useful where the micrometers are subjected to unusual wear. The micrometers are not carried in stock but can be furnished at short notice.

"Thiokol" Oil-Resistant Rubber-Like Compound

A chemical product which is claimed to have practically all the characteristics of rubber, but which is not affected by solvents such as rubber is, has been announced by the Thiokol Corp., Yardville, N. J. The product is an olefin-polysulfide reaction product known as "Thiokol." Because of its resistance to the deteriorating action of most gases and liquids, particularly gasoline and oils, it is now used in automotive work, such as on tubing to convey gasoline to the carburetor, covering for ignition wire for protection against oil and corona conditions, as well as for gaskets for electrical refrigerators to protect against refrigerant gases and tank car linings for conveying acids and solvents.

In the raw state Thiokol is somewhat similar to crude rubber. Like rubber it is compounded and vulcanized in processing the finished articles.

"Herculoy" Silicon-Bronze Alloy

Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y., has announced a silicon-bronze alloy known as "Herculoy." This material is claimed to possess the advantages of strength and corrosion resistance which characterize the silicon bronzes, and special properties which render it more readily adaptable to fabricating operations. Its strength is comparable to that of low and medium carbon steel and its corrosion-resistant qualities approximate those of pure copper.

Herculoy possesses a simple, single-phase structure similar to that of alpha brass, thereby permitting through proper annealing a range of physical properties intermediate between the limits set for elongation and tensile strength. These limits are as follows:

	Tensile Strength (pounds per sq.in.)	Elongation (per cent in 2 in.)
Hot rolled sheets	68,000	51
Cold rolled sheets	85,000	30
Cold rolled sheets, light annealed	75,000	56
Cold rolled sheets, full annealed	60,000	80
Hot rolled rods from a minimum of	67,000	60
Cold drawn rods to a maximum of	120,000	2

In wrought form Herculoy is ductile so that it may be stressed to the yield point without danger. It also has resistance to shock and is easily hot forged. A feature of Herculoy which differentiates it from similar alloys is the inclusion of tin in its composition. It has been found that tin exerts a peculiar effect of increasing the tensile strength and the ductility, and that in addition to generally improving the physical properties the tin exerts a pronounced influence on the resistance of the alloy to corrosion.

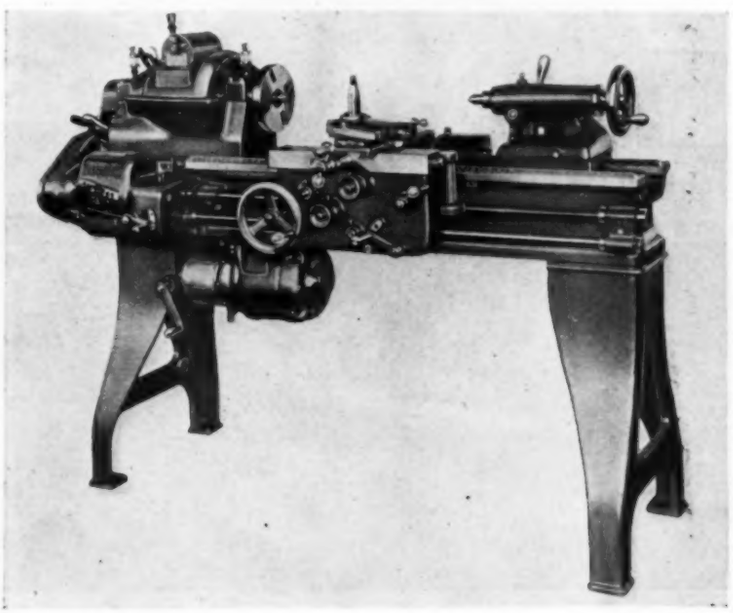
The alloy is available in the form of sheets and plates; rolls and strips; rods; bars and shafting; die pressed or hammered forgings; rivets; welding rods and in ingot form for sand castings. Some of the more common applications are as follows: Bolts, nuts, screw-machine products, turnbuckles, lag screws, transmission-line hardware, yacht fittings and accessories.

Rockford Special Economy Engine Lathes

By use of a Westinghouse-Wise drive, the Rockford Machine Tool Co., Rockford, Ill., is able to offer a motor-driven engine lathe with complete spindle speed changes at approximately the cost of a cone-head lathe. The transmission cushions starting and provides overload safety for quiet roller chain drive. A crank for changing spindle speeds is provided and does not stop the motor. The controller starts, stops or reverses the spindle. Backgears are included. Any of 32 thread-leads or feeds are secured by shifting levers. Additional and special leads and feeds can be obtained by quadrant gears.

A compact compound cross-slide is mounted on the extra wide and heavy bridge. The thread cutting dial is standard equipment. A heavy box-section apron supports both ends of the shafts. The large leadscrew has a continuous thread with no spline. The independent feed shaft has an interlocking safety clutch.

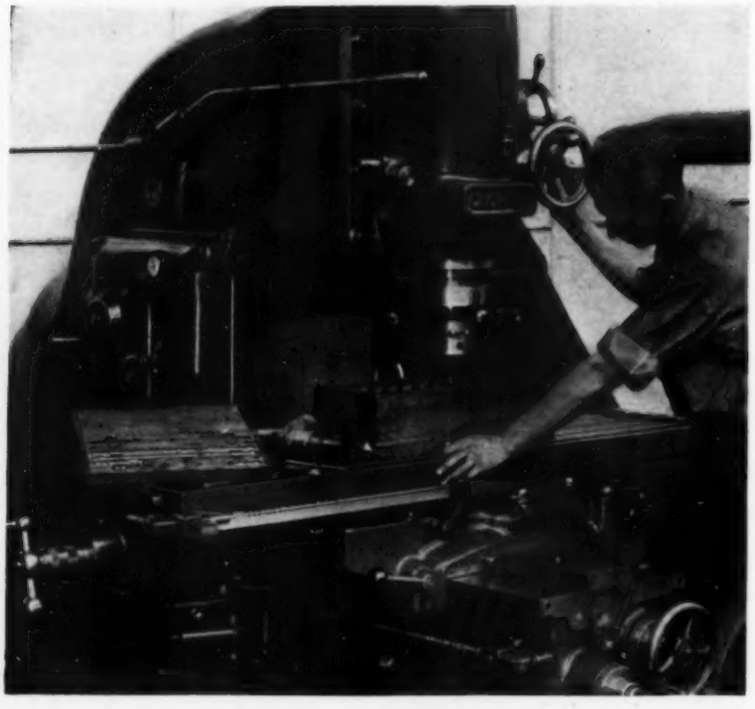
These special Economy lathes are offered in three sizes, $13\frac{1}{16}$, $14\frac{3}{8}$ and $17\frac{3}{4}$ in. swing. The corresponding distances between centers are 27, 37 and 51 in. Spindle speed ranges are 22 to 600, 20 to 600 and 15 to 580 r.p.m. Hole through the spindle is respectively $1\frac{1}{16}$ in., $1\frac{5}{16}$ in., and $1\frac{1}{2}$ in.



Precision Measuring Equipment for Cincinnati Milling Machines

Jig boring and die-sinking operations can be undertaken with Cincinnati milling machines when fitted with precision measuring equipment just announced by the manufacturer, the Cincinnati Milling Machine Co., Cincinnati, Ohio. The measuring equipment is also desirable for precision boring of small and moderate-size lots, particularly when it must be held to close limits on spacing between holes, and within a very limited range. It is possible to finish bore holes accurately spaced within one-half thousandth.

The most important advantage of the whole arrangement is the ability to rough and finish mill and bore complete. The equipment consists of one dial indicator, one micrometer head and a set of standard measuring rods for each movement; cross, longitudinal and vertical. The dials are covered and protected. Brackets and V-block hold the measuring rods and micrometer head, which are placed between the adjustable stop and dial indicator attached to the table and saddle (longitudinal movement). In boring a series of holes, the casting is so positioned on the table that the spindle lines up with the first hole. Sufficient rods are put in place until the micrometer head and dial indicator have a zero reading. To locate the next hole accurately, the necessary rods are removed to make up the even inches. The micrometer head is used to take care of the fraction of an inch, corresponding to hole center distance. The table is then moved until the dial indicator again registers zero.

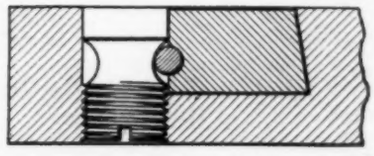


Briggs & Stratton Air Saver

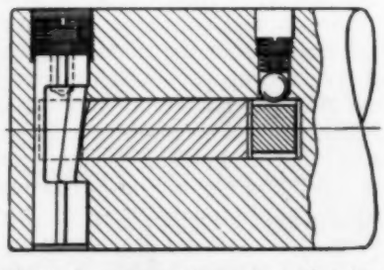
A leak-proof air valve for use on machine tools, and known as the "Air Saver," has been announced by the Briggs & Stratton Corporation, Milwaukee, Wis. The device supplies automatic, intermittent control of compressed air blasts for ejecting work, keeping dies and tools clean, and other operations. It is used on punch presses and on machine tools where drilling, broaching, reaming and similar operations require controlled compressed air blasts to save tools and permit higher production speed. As compared to a steady flow of compressed air, the automatic, intermittent control blast provided by the Air Saver eliminates expensive waste of air, is easier on the operator, speeds up production and improves the quality of work. Valve, valve seat and valve springs are of stainless steel. The air inlet bushing is of brass. The extra long valve guide is lined with a special graphited bronze bushing. Reversible operating arm, roller and bearing pins are of hardened steel.

McCrosky Block-Type Boring Bars

Block-type boring bars are now being manufactured by the McCrosky Tool Corporation, Meadville, Pa. The essential feature of this bar is a new method of locating and locking the cutting block in the bar. A key in the bar has a tapered V that locates and locks the block by engaging a V in the front of the block. By adjusting the position of this key in the bar, the block can be either locked rigid or made to float by any desired amount. Design of the key permits the contacting faces on the V to be altered easily to bring the block central in the bar in case the bar is

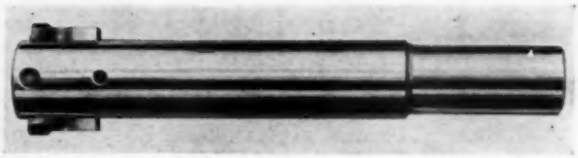


Cross-section showing pin and screw lock that clamps blades in McCrosky boring block



Vertical cross-section view showing relative position of the rotating key, cutting block and thrust block when cutting block is locked. The screw on the end of the key controls its position in the bar. Each $\frac{1}{32}$-in. of withdrawal provides 0.004 in float on a side

sprung out of line while in use. Cutting thrust is not taken by the locating key but by a hardened thrust block between the cutting block and the rear of the slot in the boring bar.



It is not necessary to remove the locating key from the bar in order to remove the cutting block. When the key has been placed in the same position as required for floating the block, the thrust block behind the cutting block can be removed easily. Then, the cutting block can be moved back and away from the locating key and withdrawn from the bar. The block can be reassembled in the bar in the reverse order.

Blades are locked in the block by an adaptation of the pin and screw lock that is used in McCrosky multiple-blade reamers. The screw has a left-hand thread, and the end opposite the thread is piloted in the block. Tightening the screw forces the pin into a groove in the blade and draws the block and blade tightly together. Action of the lock is in the same direction as the cutting thrust. It also forces the blade against the adjustment screws that enter the block from the rear end. These adjusting screws combine a relatively large diameter with a fine thread. The contact between the blade and the screw is flat and square, making possible easy, accurate adjustment of blades to micrometer sizes.

Cutting blocks are hardened to protect them from damage. Standard blades are made from high-speed steel. Stellite blades and blades tipped with tungsten carbide or tantalum carbide can also be furnished.

Standard blocks are made in five different series. All blocks in the same series have the same thickness and width. The total range of bores handled by all sizes of blocks in the five series is 1¼ to 12 in. Each size of block can be furnished in three styles—roughing, finishing and extended.

A grinding fixture for these blocks has been developed that will permit regrinding including eccentric relief.

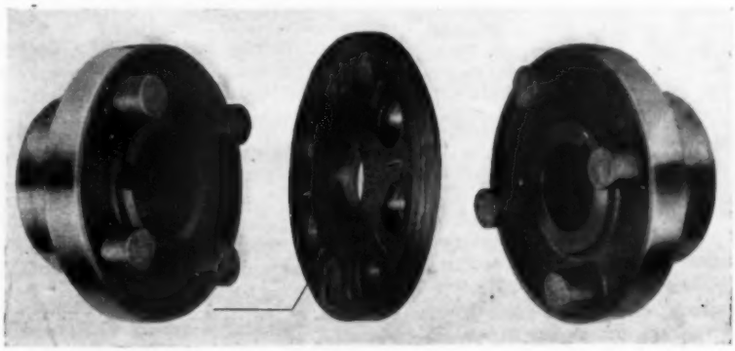
Brown Buffer-Slot Coupling

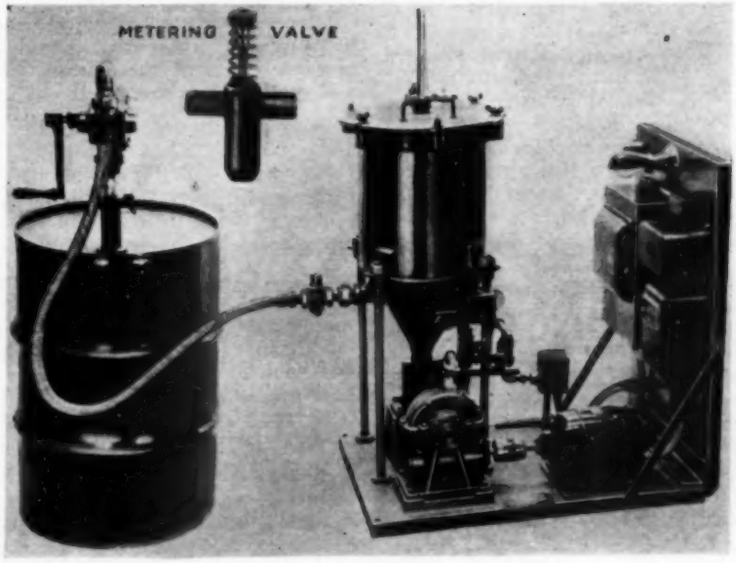
Buffer-slots cut at regular intervals in the flexible leather disk of the "Buffer-Slot" coupling give flexibility and permit the coupling to be used under conditions of angular and parallel misalignment and shock loads. This coupling has been developed by the Brown Engineering Co., Reading, Pa. The coupling can be run in either direction. The leather between the driving lugs transmits power through compression and not through tension. The Buffer-Slot disk is laminated. Driving lugs extend through the buffer-slot disk and are claimed not to wear ridges that would cause end-play when the coupling is operated for a long time in one direction. The leather disk electrically insulates the two connected units from one another. Under a sudden overload, all the buffer-slots in the leather disk close automatically and when the load becomes normal they reopen. Resiliency of the slots is such that the coupling acts as a shock absorber.

Hills-McCanna Single-Line Multi-Feed Lubrication System

The Hills-McCanna Co., 2349-2350 Nelson St., Chicago, Ill., has developed a single-line, multi-feed lubrication system. This equipment is designed for the mechanical application of light greases and heavy oils to points requiring regular lubrication. The main unit is placed in a convenient location, and a single feeder line is taken to the farthest point requiring lubrication. Branch lines are then taken from the main line to each bearing. No return line is required. An independent mechanical measuring unit is placed at each bearing.

The measuring valve is set for the amount of grease to be fed to the bearing and then acts as a shut-off valve to prevent any excess lubricant from being wasted. Pressure is supplied to the line only at the time the points are being lubricated. A pump furnishes the pressure. The system can be motor-driven, mechani-





cally operated or operated by hand crank, depending upon the service. Hoppers, valves and motors are made in sizes for a variety of services.

• PATENTS •

JUNE 14, 1932

Metal-Working Machinery

Apparatus for Actuating the Cores of a Die Casting Machine. Albert P. Rosander, Forest Park, and Francis P. Tikalsky, La Grange, Ill., assigned to Western Electric Co., Inc. Patent 1,862,551.

Metal Cutting Machine. Fayette R. Eldredge, Providence, George W. Newman, Norwood, and John B. Phillips, Riverview, R. I., assigned to General Fire Extinguisher Co. Patent 1,862,668.

Grinding or Polishing Machine. Samuel B. Field, Holbrook, Mass., assigned to Pneumatic Scale Corp., Ltd. Patent 1,862,671.

Grinding Machine. Arthur J. Strong, Detroit, Mich. Patent 1,862,809.

Grinding Machine. Max O. Trudeau, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,862,834.

Machine for Sharpening Cutters. Edward W. Bullock and Raymond Webster, Rochester, N. Y., assigned to Gleason Works. Patent 1,862,840.

Spindle for Screw Driving Machines. Frank H. Dellaree, Detroit, Mich. Patent 1,862,845.

Grinding Machinery. Hans Fritschi, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,862,850.

Grinding Machinery. Frederick S. Haas, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,862,851.

Grinding Machinery. John E. Caster, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,862,882.

Work Feeding Device. Davydd C. Hughes, Beloit, Wis., assigned to Gardner Machine Co. Patent 1,862,894.

Lathe Attachment (Indicator). William M. Elkins, Winchester, Ind. Patent 1,863,007.

Attachment for Machines for Coiling Metal. Michael Nigro, Worcester, Mass., assigned to Sleeper & Hartley, Inc. Patent 1,863,064.

Control Mechanism for Presses. John J. Wallbillich and Floyd J. Potter, Detroit, Mich., assigned to General Motors Corp. Patent 1,863,425.

Tools and Attachments

Tool Holder. Ferris T. Harrington, Detroit, Mich., assigned to Whitman & Barnes, Inc. Patent 1,862,623.

Drill Chuck. Gustave M. Nell, Detroit, Mich., assigned to Chicago Pneumatic Tool Co. Patent 1,862,761.

Grinding Device. (Lap). Carl W. Floss, Detroit, Mich. Patent 1,863,042.

Extractor for Screws and the Like. Norman Randall, Cleveland, and James B. Dillard, Cleveland Heights, Ohio, assigned to Cleveland Twist Drill Co. Patent 1,863,045.

Extractor. Thomas F. Githens, Cleveland Heights, and Joseph V. Emmons, Shaker Heights, Ohio, assigned to Cleveland Twist Drill Co. Patent 1,863,046.

Chuck. Lawrence O. Beard, Lancaster, Pa. Patent 1,863,096.

Tool Holder. John C. Glenzer, Detroit, Mich. Patent 1,863,108.

Tool Holder. (Lathe). Harry Taylor, Burlington, N. J. Patent 1,863,131.

Worm Hob. Nikola Trbojewich, Detroit, Mich. Patent 1,863,512.

Processes

Method of Joining Wires. Walter S. Hayford, Morristown, N. J., assigned to Bell Telephone Laboratories, Inc. Patent 1,863,048.

• TRADE PUBLICATIONS •

ARC WELDERS — In "The Novice Understands and the Expert Appreciates," the Harnischfeger Corp. of Milwaukee, Wis., describes in detail the construction and operating features of the Hansen arc welder, formerly manufactured by the Northwestern Manufacturing Co., Milwaukee.

CADMIUM PLATING — The booklet "More Than a Pound" issued by Udylite Process Co., Detroit, Mich., stresses the engineering service offered in connection with Udylite-Cadmium plating and mentions other facilities of interest to the customer.

CONTROLS—Catalog G, issued by the Detroit Lubricator Co., Trumbull, Lincoln, Marquette and Viaduct, Detroit, Mich., describes "Mercoid" controls of the following types: level-operated, temperature, differential, liquid level, pressure, vacuum, thermostats. Prices and specifications are given.

FLOOR PLATE—A folder describing 4-way floor plate has been issued by the Inland Steel Co., First National Bank Building, Chicago, Ill. This floor plate provides equal traction in all four directions.

LOAD CENTERS—The Westinghouse Electric & Manufacturing Co., has issued Catalog 2246 containing 76 pages on "Nofuze" load centers, panelboards and switchboards, meter services, outdoor and indoor commercial and industrial type circuit breakers, all using the "De-ion" principle of arc extinction.

MOTORS—The Ideal Electric & Manufacturing Co., Mansfield, Ohio, has available Bulletin No. 210 containing a complete illustrated description of the "Noel" motor and its capacitor, characteristic curves, and a list of advantages obtained in this design.

MOTORS—Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio, now has available Bulletin 111 on Type AA induction motors of the squirrel-cage type for two- and three-phase a.c. circuits.

MOTORS—"Small Motors" is the subject of a new bulletin issued by the Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo. The bulletin is divided into eight parts describing single-phase, polyphase, and direct-current motors in fractional-horsepower ratings. The bulletin is known as Number 167, and is in loose-leaf form to permit keeping it up to date.

NICKEL ALLOY STEELS—The International Nickel Co., Inc., is now issuing a new publication, *"Nickel Steel Topics,"* the first issue being May, 1932, Vol. 1, No. 1. This illustrated miniature newspaper is devoted exclusively to nickel alloy steels and contains technical, semi-technical and news articles dealing with production, treatment and uses of these steels in the rolled, forged and cast form, as well as a questions and answers section.

NICKEL CAST IRON—The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has available a circular chart which may be used to select specifications for nickel-iron castings. The chart is set to the specific application and physical properties will be shown in one window and corresponding chemical composition in another window. The chart is 9 in. in diameter.

ROLLED AND FORMED SECTIONS—Truscon Steel Co., Youngstown, Ohio, has compiled Handbook N-20 on rolled and formed sections which frequently eliminate the expense of complicated machining and fabrication. Sections are available in steel, aluminum, duralumin, monel metal, pure irons, special nickels, Everdur, bronze and other commercial metals.

SHEARS—The Cincinnati Shaper Co., Cincinnati, Ohio, has issued a catalog on the Cincinnati all-steel shear with hydraulic holddowns recently described in these pages. The catalog gives a complete description of all details of construction, and also a general data sheet on dimensians and capacities.

SWITCHES — "Mercury Contact Switches" issued by Providence Electric Controls, Inc., 763 Allens Ave., Providence, R. I., describes the "Magnetrole" mercury switch made in sizes from 2 amp., 125 volts, to 25 amp., 50 volts.

WELDED MACHINERY — Lukenweld, Inc., Division of Lukens Steel Co., Coatesville, Pa., has issued a booklet on "Lukenweld Construction," showing nearly 100 illustrations of welded machinery parts or machinery equipped with welded parts, and data on the benefits obtained.

EDITORIALS

June 23, 1932

K. H. CONDIT F. H. COLVIN
Editors

American Machinist—*1932 Model*

TRADITIONS TODAY are under the microscope. Old customs are changing. New methods are being introduced. Radical these new methods seem on first acquaintance, but analysis leads to recognition that they are entirely in accord with the times.

IN TUNE WITH THIS SPIRIT of change *American Machinist,* with this issue, goes from weekly to bi-weekly publication. The next issue will be published on Wednesday, July 6, and subsequent issues will appear every other week.

THUS ENDS A CHERISHED TRADITION of over fifty years, for the paper started as a monthly in 1877 and became a weekly three years later. But in its place springs a new and vigorous plan for future service to the metal-working industry. We have applied to our own problems the analytical method which we have urged on so many of our readers and advertisers.

THINGS HAVE BEEN HAPPENING in the industry of which *American Machinist* has been the voice for fifty-five years. The development of the machine in the American factory has written an epic in industrial history. Mechanization is established. The pulse of business life has quickened. Reading time is at a premium. Yet the evolution of events and experiences and the development of trends today cry aloud for comprehensive analysis, deliberate judgment and energetic action.

OUT OF MUCH COUNSEL with both readers and advertisers has come this decision to make *American Machinist* a bi-weekly periodical. The paper will continue all the essentials of its service, but it will broaden its sweep of news and opinion. It will be more closely written to provide a greater wealth of vital information in condensed space, an ideal possible of attainment because of the longer interval between publication dates.

WE ARE CONFIDENT that in the difficult days ahead lie greater opportunities for real achievement than ever before for those organizations that have the stamina to survive through depression and the vitality to recover quickly as business shakes off its long lethargy. The opportunity is equally as good for an alert publication as it is for the coming leader among its readers and advertisers. *American Machinist* is alive to this opportunity. Its every effort will be concentrated on the advancement of the industry of which it is a part.

Subscriptions will be extended. See page 804g

Consideration in Placing Orders

Purchasers of machinery or machine supplies can help or hinder the revival of business by their demands and methods. The price at which an order is placed and the delivery specified seriously affect the welfare of the maker, his men and the community in which they live.

Even assuming that the price affords a fair profit under normal conditions, unreasonable demands as to delivery may nullify much or all of the benefits that might be obtained from the business. After months of consideration, a large order was recently placed with a well known builder of heavy machinery. This shop had been staggering its work so as to retain as many men as possible and this order would have kept the shop running for three months on the staggered basis. The order, however, demanded delivery in a month.

This condition necessitated working the whole force full time including nights, and when the order was completed, the shop was almost destitute of work. Rush work of this kind is nearly always unduly expensive so that the net return to the builder was much less than if the work had spread over a three-month period. Then, too, the effect on the men cannot be entirely ignored even though it may be felt that work of any kind, day or night, should be gladly welcomed.

Buyers of any kind of product can help business revival by being as considerate as possible of the maker of the machines they buy. Reasonable delivery demands as well as reasonable prices will both help to relieve the present situation.

• CHIPS •

Republicans renominate Hoover and Curtis . . . adopt moderately wet, ultra-conservative gold standard, fairly liberal labor planks . . . country holds its fire until Democrats have acted . . . House passes bonus, by closer vote than anticipated . . . Senate kills it, thus laying one more ghost . . . Tire companies raise tire prices 11 per cent to meet Federal tax . . . gasoline prices up likewise . . . Senate struggles with relief measures . . . still some hope for loans to private enterprise.

Lausanne Conference starts with suggestions of debt cancellation . . . some observers see strong hint to U. S. . . . constructive action vitally important to world economic health . . . German swing toward Hitlerism disturbing . . . arouses ire of South German states . . . English business conditions show little improvement . . . cheer up on promise of no increase in taxes . . . Etienne Fougere, head of French National Association for Economic Expansion, urges on Herriot reduction of tariffs to prevent death of French industry . . . he was one of those most interested in building up barriers . . . Japanese Diet votes tariff increase to offset low exchange value of yen . . . U. S. had favorable trade balance of $20,000,000 in May, although total volume of foreign trade was pitifully small . . . Chile revolves . . . Davila on top again.

Machine-tool order curve seems to have established what the stock market experts call a "bottom" . . . has remained practically level for four months . . . freight loadings off 25 per cent from '31 . . . Baldwin Locomotive reports over $4,000,000 loss . . . Led by Atlantic Coast Line and New York Central, railroads start salary reductions . . . 10 per cent as of July 1 expected to be followed by another wage cut . . . Eastern railroad presidents consent to experiment with 6-hour day on four selected divisions . . . six divisions in other parts of the country will also experiment . . . results to be part of report to be made by I.C.C. to Congress Dec. 1 . . . D. & H. enginemen and firemen sign up 1-year agreement on new working conditions based on company's monthly salary plan.

Electric power output shows best comparative gain for several months . . . Engineering department of leading automatic sprinkler company, looked on as business forecaster, busy for first time since 1929 . . . Republic Steel strip mills at Warren, Ohio, resume on strength of automobile orders . . . Encouraged by better than expected May sales, automobile makers look for further increases in July and August . . . Ford stages a "truck week" . . . Rumored that Procter & Gamble will revise guaranteed 48-week full-pay year to one of 36 weeks . . . Leading bankers confident that withdrawal of gold by European central banks has ceased . . . balances remaining barely sufficient to care for ordinary business needs . . . Lee, Higginson & Co. to liquidate . . . aftermath of Kreuger crash . . . Standard Oil of N. J. goes on five-day week . . . expects to add several thousand to payroll . . . other oil companies follow suit.

· REGIONAL · REPORTS ·

DETROIT—The first half of the year ends dismally in Detroit so far as the machinery and machine-tool trade is concerned. Not only has the summer inactivity definitely set in, but prospects now are for considerable delay in the introduction of new models in the automobile industry. The brief spurt in which motorcar makers endeavored to supply dealers with cars for sale before the imposition of the new excise taxes has come to an end, and the tax and general business conditions have apparently convinced the manufacturers that the present is not an auspicious time to approach the retail market. Late fall is generally conceded to be the next period of renewed attempts on the part of the automotive industry to come back.

Orders have fallen off markedly and even the contract jobbing shops have been forced to curtail further. Sentiment in the trade is hopeful for a fair share of business in the fall, with the practical certainty of radical model changes, but right now discouragement is general. It is also felt that, Congress having imposed a tax on everything connected with the automobile industry, the worst has happened and the next movement should be upward. Machinery and machine-tool dealers are sitting tight and preparing for a strenuous sales attack after September.

CINCINNATI—Clouds in the business sky are not yet showing a silver lining. Some business was booked from general machinists and miscellaneous users, whose requirements with few exceptions were single tools. A fair number of inquiries were received, principally for single items. There is considerable tendency to buy used tools as a stop-gap, with the intention of buying new later on.

PACIFIC COAST—Expected improvement in the machine tool and shop equipment field has not materialized in the Pacific Northwest. Dealers remain hopeful but the general opinion is that no upturn is probable before early fall. One firm reports an intensive campaign to dispose of stock goods at unusually attractive prices but the response was disappointing. Conditions are unchanged. Governmental orders are less than normal but all recent turnover has come from federal sources. It is the general opinion that as soon as business conditions change, there will be considerable buying to compensate for months of delayed repairs and replacement.

INACTIVITY throughout all centers would indicate a summer dull period, if such a condition can be conceived in the light of recent industrial operations. Whatever buying is being done is largely confined to government projects. An outstanding, outspoken banker and statesman has observed more activity on the part of small enterprises during the last few weeks, and it is his prediction that such concerns will get under way first in the out-of-Egypt procession. It may be observed, however, that these same concerns were probably working hard to beat the excise taxes, and it would make more interesting reading if their payrolls were available during the next few weeks. During these times a few days of capacity production can easily take care of demand for some time to come. No doubt, Treasury officials are now scratching their heads and sharpening pencils to see how much off the receipts will be from estimates made by their Congressional friends.

DETROIT is now convinced that the present is not auspicious for introduction of new models, and efforts will be deferred until late fall for another start. Dealers and job shops appreciate the situation. Cincinnati reports that used tools are being bought as stop gaps. Pacific Coast dealers remain hopeful, but stock goods are hardly disposable. New England has not been able to obtain orders, particularly from automotive sources. Chicago is just as dull as usual. New York went for a whole week without an order, and inquiries are about as scarce.

NEW ENGLAND—Devastating features of our economic depression stand tenaciously between the machine-tool industry and a program of progress. The situation continues very discouraging from an order standpoint.

A number of metal plants have taken advantage of the period before the enforcement of the manufacturers' tax, to work overtime in order to satisfy an anticipated demand. With these programs completed extended vacations are in order. The Navy continues to release new lists.

CHICAGO—Although continued dullness in buying is still apparent in this center, sentiment remains fairly good. Inquiries still lack improvement. A slight falling off has been noted in the activity in small tool sales which had been fairly steady recently. Continued dullness is expected over the greater part of the summer but replacement buying is expected at the end of that period.

NEW YORK—Not a single order was reported by dealers in this area during the past calender week. On Monday one dealer was able to report an order from the Navy for hacksaws and a bandsaw. Other Navy lists are pending.

MATERIAL TRENDS AND PRICES

Metal prices during the week were marked with half a dozen advances and an equal number of declines. Heavy melting steel scrap dropped 50c. per ton in Pittsburgh to $9.00. Cold finished bars declined in Chicago and Cleveland. Rivets advanced ¼c. per 100 lb. in New York and dropped the same amount in Chicago. Tin, New York, repeated its 0.05c. advance of the previous week, now quoted at 19.30c. Hot rolled monel metal rods advanced 10c. to 45c., Huntington. Brass turnings and light copper showed gains in New York.

(All prices as of June 17, 1932)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$11.00	$11.00	$12.00@13.00
Buffalo, No. 2, Fdry., per gross ton	16.00	16.00	19.91@20.41
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	9.00	9.50	10.30
Furnace Coke — Connellsville, per net ton	2.00	2.25	2.40
Foundry Coke — Connellsville, per net ton	3.00	3.25	3.25
Steel Shapes — Pittsburgh, base, per 100 lb	1.60	1.50@1.60	1.65

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Iron Machinery Castings — Cost in cents per lb. of 100 fly-wheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago	4.62½	Cleveland 4.50	New York 4.75
Cincinnati	4.35	Detroit 4.00	

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Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Hot-rolled, No. 10	1.55	3.20	3.00	3.00
Hot-rolled, No. 24*	2.20	3.55	3.25	3.50
Galvanized, No. 24	2.85	4.10	3.75	4.00

*Annealed

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Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

— Thickness —	Outside Dia. in Inches						
of Wall	¼	⅜	½	⅝	1	1¼	1½
Inches B.w.g.	Price per Foot						
.035 20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.80	3.45	3.45
Cold fin., round or hexagon	3.30	2.95	2.95
Cold rolled strips	4.95	5.95	5.65
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.55	3.50
Rivets	4.25	3.30	3.75
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except stove), nuts, and lag screws, mill lots 75%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn	5.37½
Copper wire, base, Chicago and Cleveland	8.12½
Copper wire, base, N. Y.	8.00
Lead, pigs, E. St. Louis	2.90
Tin, Straits, pigs, spot, N. Y.	19.30
Zinc, slabs, E. St. Louis	2.80
Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:	
Brass rods, high	9.75
Brass sheets, high	12.00
Brass tubing, high	15.25
Copper, drawn round	12.37½
Copper sheets	14.87½
Copper tubing	14.37½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	27.00
Babbitt, com'l, intermediate grade	32.75
Babbitt, genuine, highest grade	43.00
Solder, bar, 40-60	16.00
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	45.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	1.75	1.25	1.50
Light brass	1.25	1.00	1.25
No. 1 rod-brass turnings	2.00	1.75	1.25
Heavy copper	3.50	2.50	2.62½
Light copper	2.87½	2.25	2.12½

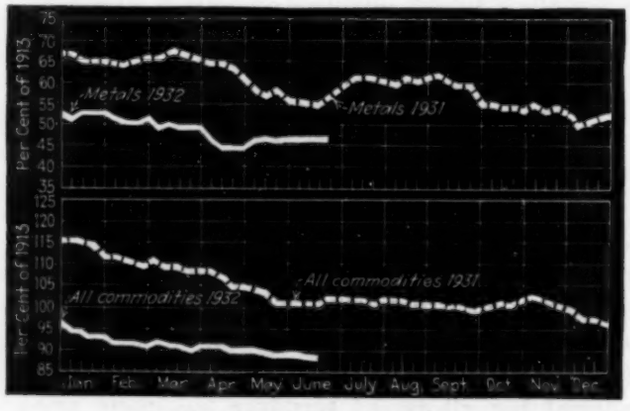
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, in 150-disk lots, per 100	$3.48	$3.48	$3.48
Belting, leather, heavy	40-5%	40-5%	40-5%
Belting, rubber, trans., Grade I	60-10-10%	60-10%	60-10%

Lumber — Per M ft., b.m., 12–16 ft. lengths, delivered, N. Y.

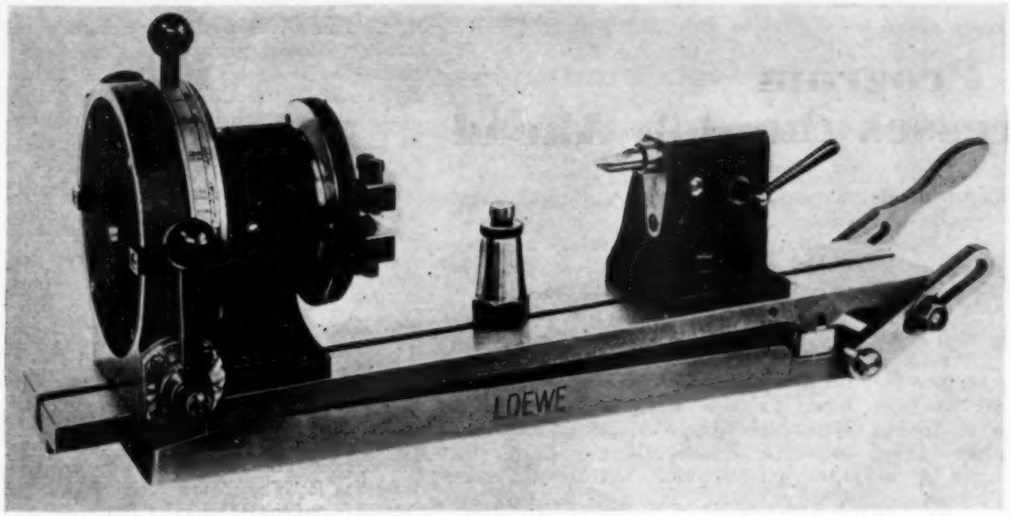
Crating — Southern pine:
1x4-in., sq. ed. ..... $27.00 1x6-in. $24.00

Skids — Spruce:
2x4-in. .$35.00 3x4-in. .$35.00 4x6-in. .$37.00 6x6-in. .$50.00

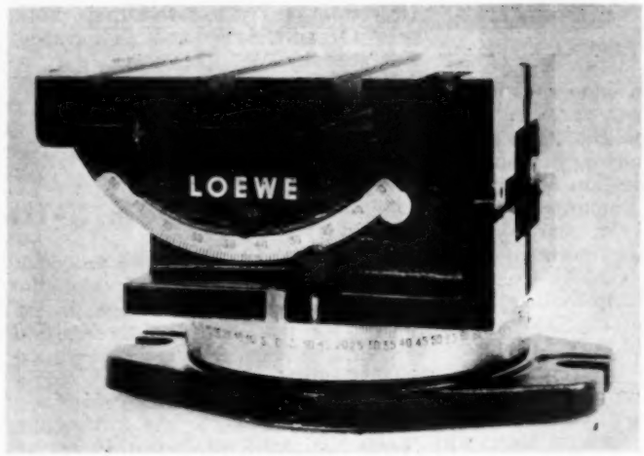

Per Cent of 1913
Metals 1932
Metals 1931
All commodities 1931
All commodities 1932
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist



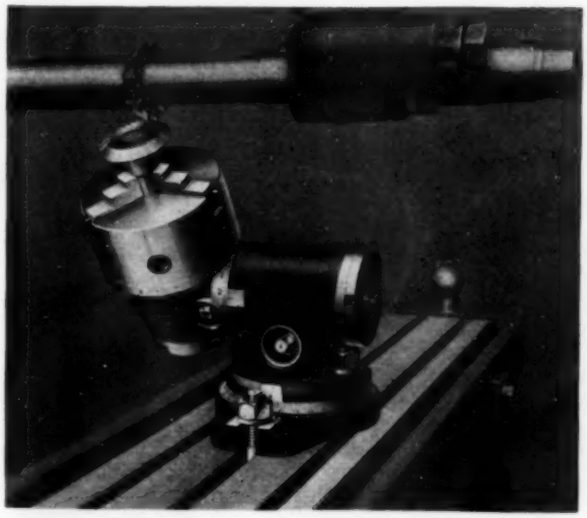
A sine bar support made by Ludwig Lowe, Berlin, does not throw the centers of the dividing head and tailstock out of line when setting up on the milling machine or surface grinder. The support is adjusted with gage blocks at the right.



Tool Room Equipment at the 1932 Leipzig Trade Fair

Ludwig Lowe also exhibited a heavy adjustable angle plate, in which the top is adjustable 90 deg. with respect to the base.

In the universal clamping and dividing apparatus made by Gebruder Harnish, Gera, the horizontal head and the vertical head swivel, and spring indexes on the spindles of each are engaged or disengaged by a stop. Holding devices that can be applied to the vertically swivelling head include a dividing apparatus with chuck (lower left), quick-acting vise (lower right), and a screw operated vise.



Silver Bay Program Stresses the Job Ahead

NEW LEVELS of management effectiveness—the job ahead—will be the general theme of the second annual conference of management problems of the smaller industries at Silver Bay-on-Lake George, N. Y., July 11 to 15. The conference, sponsored by the Silver Bay Industrial Institute, is intended to provide an opportunity for executives of smaller plants to meet and study jointly a number of present day industrial problems as they affect operation in the smaller units of industry. Consultation with approximately 2,000 plant officials determined those management problems which are of most interest to executives in smaller industry at the present time.

The nine sessions starting Monday afternoon, July 11, provide many papers on finance, sales, production and personnel. With RALPH E. FLANDERS, vice-president and general manager, Jones & Lamson Machine Co., presiding at the opening session, the first paper will be "The Importance of the Smaller Plant in Our National Economic Structure," by FREDERICK M. FEIKER, director, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce. This will be followed by "Taking Stock of the Smaller Plant's Advantages," by D. R. STEVENS, vice-president, The Okonite Co. During the keynote session on Monday evening, with JOHN M. CARMODY, editor, *Factory & Industrial Management*, presiding, an address "New Levels of Management Effectiveness—The Job Ahead" will be delivered by PROF. ERWIN H. SCHELL, in charge of the department of business and engineering administration, Massachusetts Institute of Technology. The discussion of the keynote address will be directed on the following viewpoints: finance, sales, production and personnel.

Session on the following days will be held in the morning and evening to leave the afternoon free for informal discussion among attending executives and for recreation. For the Tuesday morning session the theme for the program has been established: budgeting for adequate profits, with HOWARD S. SMITH, superintendent, Trumbull Electric Manufacturing Co., presiding. DR. CHARLES REITELL, director of The Greater Pennsylvania Council, and head of the department of accounting and industry, University of Pittsburgh, will deliver "The Application of Budgetary Control to the Smaller Industrial Unit." He will be followed by FRANK L. SWEETSER with "Operating Data Essential to Budgeting." Tuesday evening will be devoted to "Installing and Operating the Sales Budget" by HARRY E. HOWELL, auditor, General Fire Extinguisher Co., and "Budgetry Control of Direct and Indirect Production Expenses" by JAMES V. TONER, president, Saart Bros. Co.

The Wednesday morning and evening sessions will be devoted to two different programs. At the morning session with O. D. REICH, vice-president in charge of manufacturing, Dexter Folder Co., presiding, the general theme will be "Adjusting Production Costs to New Price Levels." E. D. MARTIN, vice-president and general manager, Emark Battery Corp., will speak on "Product Control vs. Process Control," and THOMAS E. CONWAY, factory manager, Ceco Manufacturing Co., will deliver 'Eliminating Avoidable Manufacturing Expenditures." In the evening session the program will center about "Incentive Plans in Smaller Industries, with ALLAN H. MORGENSEN, assistant editor *Factory & Industrial Management*, presiding. The first paper on the program, "Practical Methods of Determining Production Standards and Application of Payment Schemes to Plant Employees," is by STEWART M. LOWRY, in charge of organizing and directing incentive activities for Procter & Gamble Co. The other paper is "Compensating Sales Forces" by MERRILL B. SANDS, vice-president in charge of sales, Dictaphone Corp.

Two separate programs will feature the meetings on Thursday. During the morning session the general topic will be "Improved Marketing Methods" with W. E. BOOTH, director of sales research and analysis, The Foxboro Co., presiding. The first paper on the program is "Marketing-Research and Analysis" by R. H. DICK, president, Barrington Associates. The second paper is "Getting the Most Out of A Small Advertising and Sales Promotion Expenditure" by L. H. WEBER, advertising manager, The Osborn Manufacturing Co. Thursday evening will be given over to consideration of "Industrial Stabilization, Relief and the Economic Problems of Employees" with the HON. FRANCES PERKINS, industrial commissioner, State of New York, presiding. JOHN H. FAHEY, president, *Worcester Post*, will discuss "The Alternative to Employment Stabilization—The Relief Situation in The Year Ahead." He will be followed by B. E. SHLESINGER, patent attorney, Gleason Works, Rochester, N. Y., on "Providing for the Economic Problems of Employees."

All sessions on Friday will be centered around the general topic of "Co-operation Between Smaller Industries and Relationship with Trade and Business Associations." EDWARD O. OTIS, JR., executive secretary, New England Manufacturing Jewelers & Silversmiths Association, will preside R. L. TWEEDY, secretary and managing director, Manufacturers Research Association, will speak on "Can The Principles Governing the Operation of the Manufacturers' Research Association be Applied to a Group of Local Smaller Companies?" In considering the cost and objective of a health program, VIOLET H. HODGSON, assistant director, National Organization for Health Nursing, will speak on "What Are the Possibilities of Developing a Joint Health Program?" "The Public Employment Center of Rochester, New York, and Similar Activities," a paper by JESS T. HOPKINS, manager, Public Employment Center of Rochester, will demonstrate the effectiveness of a central public employment office for communities. The fourth paper on the program is "The Co-operative Research Activities of the Meehanite Institute" by WILSON W. BURDEN, of Witte & Burden, Detroit. The last paper is "Greater Utilization of Trade Associations, Business Organizations, and Government Bureaus" by W. J. DONALD, partner, J. O. McKinsey & Co.

Power Show Dec. 5-10

Manufacturers of power-producing machinery, mechanical devices for power transmission, precision instruments for the control of combustion, pressure, volume, flow and other measurable entity, material handling equipment and heavy electrical machinery will stage exhibits in the forthcoming Tenth National Exposition of Power and Mechanical Engineering at the Grand Central Palace during the week from December 5-10, which is coincident with the annual meeting of the American Society of Mechanical Engineers. These 293 manufacturers are now preparing exhibits and the large attendance which is expected of representatives from every state in the Union, as well as many foreign countries, will find things of considerable information and inspiration, ideas which will be of assistance to them in their work and plant operations. During the past two years, the interval since the ninth exposition, a considerable amount of research work has been carried on and completed and the results of this research work will be shown. The exposition is being conducted by the International Exposition Co. with offices at Grand Central Palace, New York.

Employment Service in Philadelphia

The Engineers' Club, 1317 Spruce St., Philadelphia, supported by the Philadelphia chapters of 12 affiliated engineering societies, has organized the Philadelphia Technical Service Com-

A Change in Subscription Price

With the change from weekly to bi-weekly publication, effective July 1, announced on page 804a, the *American Machinist* domestic subscription price drops from $5.00 to $3.00 a year; Canadian from $7.50 to $4.00 a year (including Canadian tax); foreign from $9.00 to $6.00 a year.

All present subscribers will of course receive the benefit of this reduction by having their subscriptions extended in the ratio of the change in rate; that is the unexpired portion of each subscription from July 1 will be extended by two-thirds.

For example if a subscription expires December 30, thus having six months to run from the date of the change in publication frequency, at the old rate, the expiration date will be extended to April 30, 1933, or by four additional months of service. All such credits will be adjusted automatically on the subscription records of the publishing office.

mittee for the purpose of assisting the employer of technical talent to secure readily the proper men for each opening, and the unemployed engineer to find employment. This committee's co-operation with the Pennsylvania State Employment Commission assures its permanence. Its facilities will be found available without cost to either employer or employee.

Eight hundred and fifty competent. trained men are now registered with the committee, and the list, covering a wide range of activities, includes executives, plant engineers, production engineers, process technicians, as well as salesmen, purchasing agents, designeers, draftsmen and chemists.

In addition to the placement service, a job consultation service is offered. Upon request, a technical employment specialist of wide experience will help the prospective employer to prepare his job specifications. This is to aid him in securing the best the field affords for the handling of his technical problems.

Imports and Industrial Activity Quicken in Soviet Russia

FROM OUR BERLIN CORRESPONDENT

THE Soviet Union was the only country of the world in 1931 to show increased imports in bulk and value, compared to the two previous years. Its imports were also considerably larger than those of the former tsaristic Russia. While Russia, within the limits of the present territory of the U.S.S.R., imported goods to the average value of 857 million roubles (approximately 400 million dollars) during the years 1909-1913, the U.S.S.R.'s imports during 1931, at almost equal world market prices, were 26 per cent higher.

The third year of the successful realization of the Five Year plan in four years was remarkable for the further considerable increase in the import of means of production, especially of metals and metal products. The Soviet Union may justly be called the metal importing country at present, as the proportionate value of the metal group (comprising raw materials, semi-finished parts and machine equipment) has risen from 42.7 per cent in 1929 to 61.6 per cent in 1930, and even to 74.4 per cent in the year 1931. Twenty-eight per cent of German machine exports, 65 of British machine tool exports, 61 of American exports of agricultural implements and tractors, 80 of the Polish, and 40 of Czecho-slovakian iron exports went to the U.S.S.R. in 1931.

While the Soviet Union's share of the world's machine imports amounted to approximately 6 per cent in 1929, it rose to 13 per cent in 1930, and to 23 per cent in 1931. Though the total world exports of machines to other countries in 1931 were 27 per cent lower than in 1929, the Soviet Unions' imports rose to 237 per cent of the 1929 quantity. In 1929, for instance, Canada still imported more machinery than Soviet Russia, but in 1931 Soviet machine imports exceeded those of Canada by more than five times the latter's quantity; they were equal to those of the next important three countries together—France, England and British India.

In the machinery group the increase in imports was most marked in industrial machines, while the import of agricultural machinery greatly diminished, apart from tractors and combines. The import of the latter took place exclusively during the first quarter. Since then it has practically disappeared, because of the opening of the giant Soviet tractor and combine plants.

Russian Industrialization

On April 20th the Stalingrad tractor works Dsershinskij supplied 144 tractors, the plant having thus attained its projected capacity. No doubt such a result is of utmost importance. It represents the reply to many a discussion in foreign countries concerning technical problems in the U.S.S.R., and in particular to tractor construction in that country. It must be admitted that the Russians have worked very successfully here, in direct contrast to rumors circulating chiefly in Germany and America, stating that newly erected Russian plants are compelled to close down for want of suitable workmen. The 1932 program of the entire Soviet tractor industry provides for an output of 83,000, thus taking the first place in the world production.

One of the principal problems of the U.S.S.R. in 1932 will be the development of the steel mill industry, and increase of the pig-iron production from 5 to 9 million tons.

During the first quarter of 1932 the plant Krasnoje Sermowo produced 30 locomotives, the Kolomna works 42, the Luga works 91, and the Komintern plant at Charkow 47 locomotives.

Another giant plant, the first government ball-bearings factory, was inaugurated at Moscow a few weeks ago. It was erected within a year, and its projected capacity amounts to 24 million ball-bearings annually. Thus it is the largest of its kind in the world. When fully occupied the works will employ 15,000 people. Further enormous ball bearing works are being erected in the Ural district.

During the last few weeks the Russians have again resumed their buying activity in Germany to a great extent.

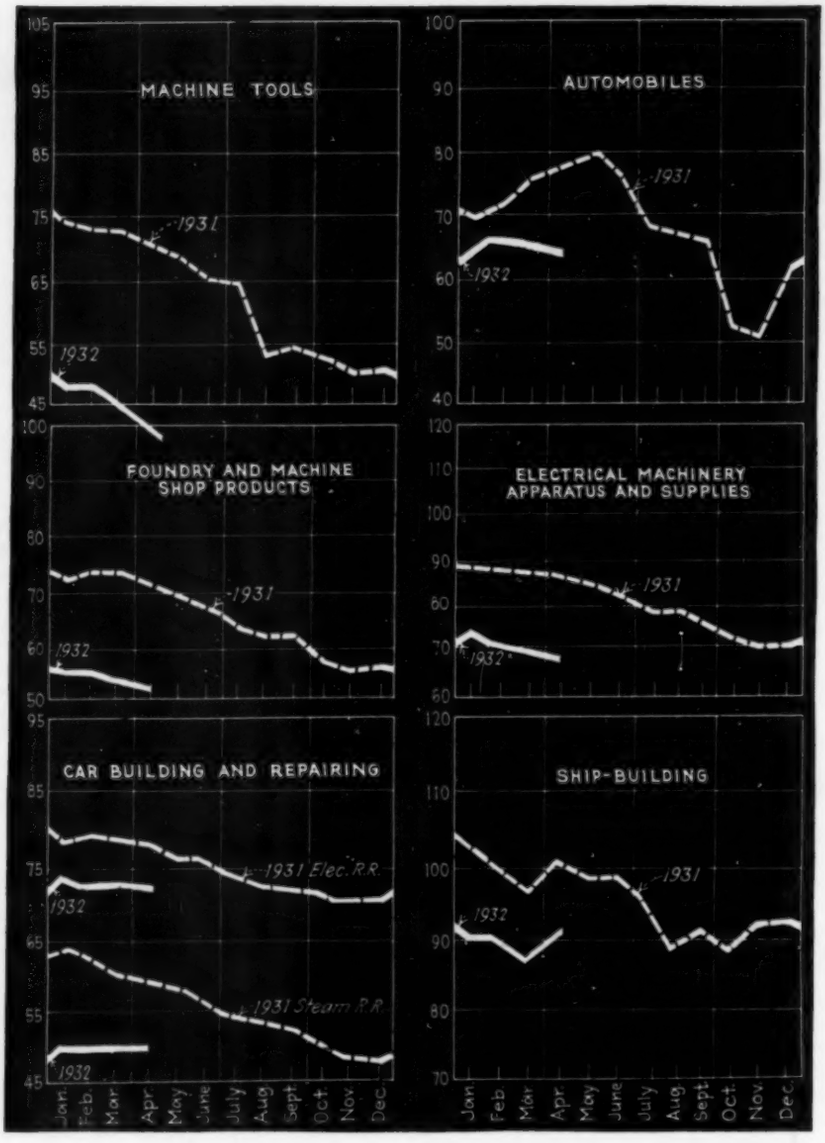
S.A.E. Nominations Deferred

At the semi-annual business meeting of the Society of Automotive Engineers, Tuesday, June 14, during the summer meeting of the society at White Sulphur Springs, W. Va., it was announced that nominations for officers would not be made public until later in the year.

Employees Sales Net $1,500,000

Sales totaling $1,503,268 in May are reported by the Westinghouse Electric & Manufacturing Co. as the result of the first 30 days of the May-June employee sales campaign. Sales numbering 35,607 were developed, mostly for domestic appliances, and reached more than the pledge of one sale per individual. The company's 53,000 stockholders have also entered into the campaign. When the Westinghouse cam-

paign was announced, May 1, many other companies requested information concerning details of the plan. Since May more than a dozen have launched similar campaigns. The cumulative effect of these commercial crusades should make a definitely favorable impression throughout the United States.



Trend of Employment in Metal-Working Industries Monthly Average for 1926 = 100. Data supplied by the Bureau of Labor Statistics

Weights Conference Postponed

The Twenty-fifth National Conference on Weights and Measures was to be held in Washington early in June. However, in the interests of conservation of public funds it seemed advisable to postpone the conference until next year and a proposal to this effect by the officers was approved by an almost unanimous vote of the Executive Committee.

French Quota Raised on American Tools

REVISED rules for the operation of the quota system of imports into France, including machine tools, are the result of the joint efforts of the Departments of State and of Commerce, according to Henry Chalmers, chief, Division of Foreign Tariffs, U. S. Department of Commerce. The existing quota allotments come up for renewal at the beginning of the third quarter, namely, July 1. Under the revised rules, it is expected that separate quotas for the United States will be established for the various types of machine tools now under restriction in France, with the quantities for each quarter equal to one-fourth of the full amount imported from the United States during 1931. On most of the machine tools under quota the United States now shares a combined quota with a number of other countries for which no separate quotas were assigned; so that it is difficult to indicate the precise measure of improvement under the new arrangement. However, the fact that the new allotments are to be based on the imports during the last unrestricted year, without curtailment, seems a decided improvement. In fact, on metal-working machine tools, it appears that the new quota for the United States alone will be much larger than the amount that can now be imported from the combined group of unspecified countries which includes the United States.

In order to regularize the flow of trade and to minimize over-shipments of restricted goods in the future, the French Government has assured the United States that they will make available to French importers, at several specified places in France, the monthly statistics showing the status of importations of commodities under quota. Distributors in France should, therefore, now be in a better position to estimate the amounts that they will be allowed to import before they ask for further goods.

Opinion in some quarters is to the effect that the Webb-Pomerene export trade association law might serve as a means of perfecting such organizations in the various industries, but the fact that it has never been extensively utilized in the past indicates that exporters are not able to pool their interests for collective benefit. Other industries in other countries have been able to accommodate themselves to the French system by coordinating in this way their exports with the French import limitations, thereby assuring each exporting firm a fair share of the business.

However, in these cases they are practically members of a cartel that exerts rigid discipline. One source thinks it doubtful that the American firms would submit to a licensing system and anticipates that the Commerce and State Departments would be continually annoyed by firms that complain of not getting their fair share of the business. It is also pointed out that such a system of control would prevent new firms from engaging in the business. It would seem that the matter rates some discussion because confusion under the revised quota rules may perhaps be as bad as it has been in the past. It may be predicted that the French market will be in a perpetual state of feast and famine with very little profit to any of the American exporters engaged in the business unless some sensible, not too restrictive program can be evolved.

Thin-Film Lubrication Discussed

In jointly presenting the paper, "Frictional Characteristics of Journal Bearings in the Region of Thin-Film Lubrication" at the Summer Meeting of the Society of Automotive Engineers, the authors, S. A. McKee and T. R. McKee, of the Bureau of Standards, said that the trend of development in the automotive industry has been toward the use of higher speeds and higher pressures, with a consequent necessity for a greater rate of heat dissipation by the bearings and a greater possibility of oil breakdown. Because of this trend a marked difference of opinion has arisen as to whether or not the criterion for bearing design should be based strictly on concepts derived from characteristics typical of fluid-film operation. Realizing the importance of this question, the work at the Bureau of Standards on the study of bearing friction had been extended to include this investigation of the effects of systematic changes in the various factors of operation upon the friction of the bearing when conditions are such that a complete film of the lubricant is not maintained between the rubbing surfaces.

The frictional characteristics of journal bearings in the region of thin-film lubrication indicated by this investigation may be summarized as follows:

1. The coefficient of friction of a journal bearing in the region of thin-film lubrication is not a function of the generalized operating variable ZN/P alone but is also dependent upon the particular values of the individual operating variables.

2. For a given bearing operating with a given lubricant, an increase in load or speed tends to decrease the value of ZN/P at the point of minimum friction.

3. In the region of thin-film lubrication, an increase in load with a proportional increase in speed to maintain a constant value of ZN/P tends to reduce the coefficient of friction of a given bearing operating with a given lubricant.

4. The composition of the bearing metal has a marked effect upon the frictional characteristics of bearings in the region of thin-film lubrication, the point of minimum friction for a babbitt bearing occurring at a considerably lower value of ZN/P than that for a bronze bearing of similar proportions operating with the same lubricant and at the same load.

THE BUSINESS WEEK

June 22, 1932

Security markets have been steadied and financial anxieties soothed by forecasts of cessation of the gold outflow, despite the fundamental fact that the increased value of the dollar abroad and at home puts additional handicaps on our export trade and further pressure on commodity prices both now relapsed to pre-war levels . . . Although temporary removal of this alibi for inaction and hopeful expectations of favorable results from Lausanne have brightened sentiment somewhat, member bank credit contraction continues at a drastic rate and leading business indicators have dropped to new lowe levels . . . Structural steel requirements have risen under stimulation of public construction, but steel activity and coal output have dropped to dismal depths . . . Merchandise carloadings also have declined with the sharp recession of retail trade under pressure of curtailed consumer purchasing power and employment . . . Improvement in electric power production and check payments, however, have helped sustain the surprisingly stationary position of our general business index during the past three months . . .Uncertainty regarding relief legislation and congressional adjournment, as well as the outcome of uropean conferences and the domestic political campaign still overshadows the summer outlook, but the prospect for further procrastination in comprehensive, cooperative action on all important issues is as favorable as ever for those who feel that they can safely be left to the laissez-fairies.

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Employment Rises in Michigan

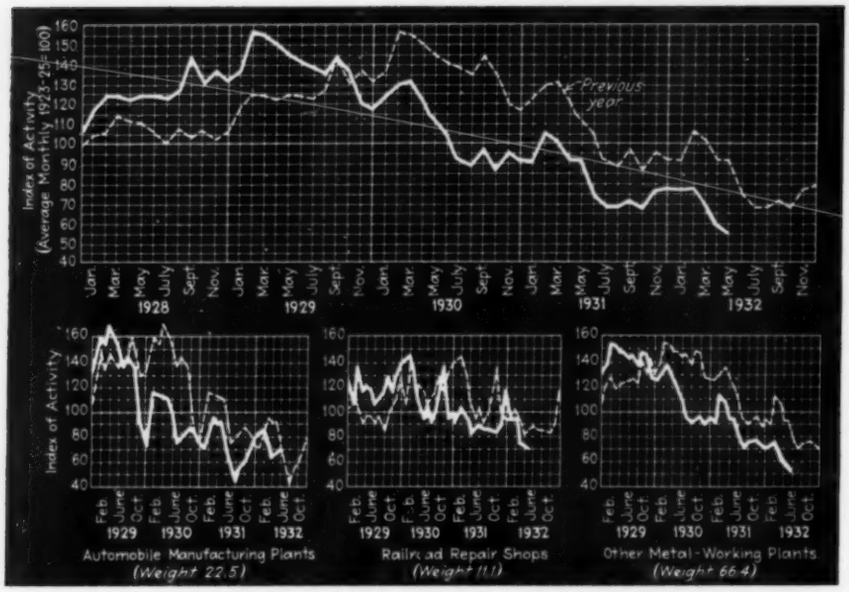
Employment in the automobile industry in Michigan during May totaled 140,049 against 136,335 in April and 187,253 in May of last year, according to the State Department of Labor and Industry, based on the reports of 52 companies. The aggregate weekly payroll was $3,685,291 in May, $3,282,932 in April, and $5,865,896 in May last year.

The Russian Government is seeking a license to use the continuous rolling process owned by the American Rolling Mill Co. in a $20,000,000 mill at its new power plant on the Dnieper River, as was disclosed by Robert A. Solborg, vice-president of Armco. American engineers will build the plant and American machinery will be utilized as far as possible. The plant will have an output of upwards of 500,000 tons annually.

May Metal-Working Activity Little Changed from April

Consumption of electrical energy for power purposes showed metal-working activity during May to be very slightly below the figure for April. The May index was 61.8, and the April value was 62.1. Indexes for preceding months were: 70.0 for March, 79.2 for February, 77.6 for January, 77.8 in December, 75.6 in November, and 69.4 in October. These figures are all adjusted for 26 working days, as are those which follow:

The automobile shop index rose to 71.2 from 64.4 in April, 69.2 in March, and 85.3 in February. In previous months it was: 83.6 in January, 78.1 in December, 65.5 in November, and 67.4 in October. The railroad repair shop index rose slightly to 75.3 in May as compared to 75.1 in April. Figures for the preceding months were 81.9 for March, 92.6 in February, 91.5 in January, 118 in December, 94.9 in Novemer, 84.5 in October. Ferrous and non-ferrous metal-working plants not included in the railroad and automobile groups had a May index of 56.3, off 3 points from the April index of



59.1. In this group, figures for the preceding months were: 74.8 in February, 72.7 for January, 70.9 for December, 76 for November, and 71 for October.

When the figures are adjusted for seasonal variations, slight revisions occur. The railroad repair shop index rises to 77.2, and the general metal-working index falls slightly to 55.0, while the automobile shop index dropped to 60.7. This gives a total seasonally adjusted figure of 58.8 as compared to 61.8, for the unadjusted index. Railroad repair shop seasonally adjusted indexes in previous months were: April, 72.7; March, 78.5; February, 81.8; January, 86.5; December, 116; November, 90.1. Similar automobile shop indexes were: April, 53.9; March, 60.4; February, 81.8; January, 98; December, 114.2; November, 78.1; October, 55.4. For the other metal-working plants the adjusted figures for previous months were: April, 57.6; March, 59.4; February, 67; January, 68.7; December, 73.2; November, 78.1; October, 72.5. Figures for the entire group were: April, 58.5; March, 61.7; February, 72; January, 77.3; December, 87.2; November, 79.4; and October, 70.1.

BUSINESS ITEMS

The General Alloys Co., Boston, has entered into a contract with two French concerns whereby the latter will manufacture all products now made by the Boston company for a period of ten years. The French companies are Fours et Appareils Stein and Ste. d'Electro Chimie et Acieries Electriques d'Ugine. R. D. ALGER, superintendent, or R. J. YOUNG, assistant superintendent of General Alloys Co., will go to France in the late summer to install American practice in the French plants.

Organization of the National Safety Appliance Co., Ltd., with headquarters in San Francisco, was announced June 10. The company has $1,000,000 capital authorization and will manufacture and market safety appliances for railroads. Directors named were C. W. DURBROW, H. S. BRIDGE, GUIDO MUSTO, E. C. SCHMITT, and F. A. SOMERS.

The Ross Heater Mfg. Co., Inc., Buffalo, N. Y. has appointed G. G. VAN PUYL, formerly connected with the sales department of the Foster-Wheeler Co., as representative for western New York with headquarters at Rochester. ARNO N. DIETZ, has been appointed Milwaukee representative with offices in the Security Building.

The Mattson Wire & Manufacturing Co., McDonough and Railroad Sts., Joliet, Ill., has been acquired by the Keystone Steel & Wire Co., Peoria, Ill., it has been announced by HARRY I. MATTSON, president of the Joliet concern. Capital stock of the Mattson firm has been increased from $44,000 to $100,000, and the plant will be operated as formerly.

After July 1, the factory and offices of the Holo-Chrome Screw Corp., Hartford, Conn., manufacturers of hollow-head cap and safety setscrews and pipe plugs, will be located at Bristol, Conn.

Foster-Wheeler Corp., New York, has appointed Consolidated Steel Corp. Ltd., Los Angeles, its exclusive sales and manufacturing representative on the Pacific Coast. The Consolidated Company will handle the entire Foster-Wheeler line. Most of the Foster-Wheeler equipment for the Pacific Coast will be manufactured by the Consolidated company in its new shops at Slauson and Eastern Aves., Los Angeles.

The Budd Wheel Co., Philadelphia, has declared the regular quarterly dividend of $1.75 on its 7 per cent preferred, payable June 30. The directors announce that "this action is in recognition of the favorable position of the company which has enjoyed an increase in sales each month of the current year over the preceding month."

Clouse Machine Products Co., Indianapolis, Ind., has taken over part of the plant of the Marmon Motor Car Co. R. M. CLOUSE is head of the company which specializes in tool and machine products and gears.

The Daney Aluminum & Bronze Casting Co. has been organized in Toledo by FRANK J. DANEY, formerly superintendent of the France Foundry & Machine Co.

Ray Burner Co., San Francisco, has appointed the Case Hardening Service Co., 2281 Scranton Road, Cleveland, its sales representative in Cleveland and vicinity.

PERSONALS

JOHN J. BATTERMAN, formerly vice-president and treasurer of the Gabriel Co., has been elected president and treasurer. DAVID BENJAMIN, previously secretary, is now vice-president. HARRY D. KINNEAR was made vice-president in charge of manufacturers' sales and CHARLES F. GUMMO, formerly controller, was elected secretary. The Gabriel Co. recently resumed operations at the Gabriel Kari-Keen Co., Sioux City.

GEORGE W. BURRELL, president of the Wellman Engineering Co., Cleveland, was recently honored by the Ohio State University with the professional degree of mechanical engineer. At the age of 16 Mr. Burrell entered the employ of the Cleveland Rolling Mill Co. as apprentice machinist. In 1891 he entered Ohio State and studied mechanical engineering for three years. In 1894 he returned to the Cleveland Rolling Mill Co. and entered the drafting department, and the following year, 1895, he was employed as a machinist and draftsman by the Consolidated Steel & Wire Co., Rankin, Pa. In 1898 Mr. Burrell was employed as draftsman by the Wellman Engineering Co., and in 1928 was made president and general manager, which position he now holds. He is a member of the Iron & Steel Institute, and the Cleveland Engineering Society.

ALDEN C. CUMMINS, recently director of power distribution, has now assumed the position of assistant general superintendent of the Duquesne steel works of the Carnegie Steel Co., Pittsburgh, succeeding DAVIS C. BURROUGHS, who resigned Jan. 31. In 1911 Mr. Cummins joined the Carnegie Steel Co. as draftsman and successively became assistant superintendent of the electrical department, superintendent of the ferroalloy furnace and electrode factory and superintendent of the electrical department at Duquesne steel works.

RALPH E. FLANDERS, manager and director of the Jones & Lamson Machine Co., and a former vice-president of the American Society of Mechanical Engineers, received an honorary degree of mechanical engineer at the Stevens Institute of Technology recently. In presenting him for the degree, President Davis referred to Mr. Flanders as an "industrial executive, author, analyst of social problems peculiar to this age of mechanical perfection, a lay philosopher whose approach is significant of the specialist in engineering and whose conclusions are helping to shape the thinking of our generation."

H. T. GILBERT has resigned as sales manager of the Midland Steel Products Co., Cleveland.

W. L. HAYS has retired as Cleveland district manager of wire mills for the American Steel & Wire Co. The office of district manager has been abolished and the work absorbed by the vice-president in charge of operations. G. H. PETERS has been appointed assistant to the vice-president.

F. J. JAROSCH has been appointed general superintendent of the Roller Bearing Co. of America, and will have entire charge of manufacturing. He has been actively engaged in the manufacture of anti-friction bearings for over 20 years and was formerly connected with the SKF industries, Gurney Ball Bearing Co., and the D. W. F. Co. of Germany.

R. E. LANKFORD has been appointed works manager of the J. A. Fay & Egan Co., according to an announcement by R. W. EGAN, president. Mr. Lankford has had large experience in plant management and also on tools, dies, fixtures and equipment in diversified lines of machinery. He will have complete supervision of the design, engineering and manufacturing of the new line of precision, high-speed woodworking machinery soon to be placed on the market.

J. G. LANNING, has been appointed chief engineer of the Hawley-Jones Corp., Corning, N. Y., manufacturer of brakes and accessories for automobiles and trucks. He was formerly connected with the Detroit Lubricating Co. and Manning, Maxwell & Moore.

E. A. MOTT, vice-president and general manager of the Cockshutt Plow Co., Brantford, Ont., has announced his retirement after 43 years of service.

D. V. SHERLOCK, for the past ten years superintendent of the Strong Steel Foundry Co., Buffalo, is now affiliated with the Union Steel Casting Co., Pittsburgh, as general superintendent.

R. H. SMITH, associated with the Boston office of the Reliance Electric & Engineering Co., Cleveland, has been appointed manager of the company's development engineering department at the home office. C. E. ROBINSON succeeds Mr. Smith as district manager in Boston.

FRANK J. SPRAGUE, scientist and inventor, and a pioneer in applications of motors, railways and elevators is to be honored by a meeting to be held July 25 at the Engineering Societies Auditorium, 29 West 39th St., New York, N. Y. The committee sponsoring the event includes all the presidents of the engineering societies and related associations. The speakers will be DR. JOHN H. FINLEY on "An Engineer's Contribution to the World's Welfare"; FRANK HEDLEY, "An Engineer's Contribution to Transportation"; and REAR ADMIRAL S. S. ROBINSON, U.S.N.

SAMUEL M. STONE, president of the Colt's Patent Fire Arms Manufacturing Co., Hartford, was elected president of the Manufacturers' Association of Hartford County at its annual meeting recently. Mr. Stone succeeds CLAYTON R. BURT, president and general manager of the Pratt & Whitney Manufacturing Co.

LEW E. WALLACE has been appointed New York district sales manager of the Youngstown Sheet & Tube Co., succeeding W. B. BLOWERS, who will continue with the company as a special representative.

WILLIAM E. WICKENDEN, president, Case School of Applied Science, Cleveland, has been elected vice-president of the Cleveland Engineering Society.

• OBITUARIES •

W. T. KENDALL BROWN, chief of the engineering staff, Winchester Repeating Arms Co., New Haven, died June 12. Mr. Brown was a member of the American Institute of Electrical Engineers.

WILLIAM FARRICY, 75, formerly general superintendent of the Straight Line Engine Co., Inc., Syracuse, N. Y., died suddenly June 14. Mr. Farricy was the first superintendent of the Halcomb Steel Co. now part of the Crucible Steel Co. of America. Later he was general manager of a steel business at Williamsport, Pa.

PERRY W. HARVEY, for many years a director of M. A. Hanna Co., Cleveland, and a former director of the Cleveland Folding Machine Co., died recently.

AXEL Z. JOHNSON, 48, chief mechanical engineer of the Dahlstrom Metallic Door Co., Jamestown, N. Y., for more than 25 years, was killed from motor exhaust June 13. Mr. Johnson has been identified with the Dahlstrom company since its organization.

DR. ADOLF KREBS, consulting engineer and manufacturer of Boston, died June 16 at the age of 67. Dr. Krebs was born in Wiesbaden, Germany, and obtained his Ph.D. degree at the University of Berlin and an engineering degree at the Charlottenburg Polytechnic Institute. He had been connected with the German General Electric Co. and with Siemens & Halske in important engineering and administrative positions. At the time of his death Dr. Krebs was connected with the General Welding & Equipment Co., Boston, manufacturers of shape cutting machines.

H. L. MCCLAREN, who was president of the Mitchell Motor Car Co., Racine, Wis., from 1913 to 1919, died recently.

J. F. MCMILLAN, treasurer and manager of the Kingston Shipbuilding Co., Toronto, Ont., died June 14. He was 52 years of age.

JAMES R. MORASH, 52, president and general manager of the General Refrigeration Co., Beloit, Wis., manufacturers of heavy-duty refrigeration units. died June 9. For 27 years he was associated with the General Electric Co. at Lynn, Mass., and later at Chicago. He became head of the Beloit concern when it was reorganized out of the Lipman Refrigeration Co. in 1923.

THOMAS D. RUSSELL, vice-president of the Morgan Engineering Co., Alliance, Ohio, died recently at the age of 68. He had been with the Morgan concern for 46 years and was widely known in the industrial world.

WALTER T. SEWELL, 46, secretary and treasurer of the Sewell Cushion Wheel Co., Detroit, and its former president, died suddenly June 17.

• MEETINGS •

AMERICAN SOCIETY OF MECHANICAL ENG'RS
Second National Applied Mechanics Meeting, Yale University, New Haven, Conn., June 23-24-25.
Semi-Annual Meeting, Bigwin, Canada, June 27-30.
National Machine Shop Practice Meeting, Buffalo. Week of Oct. 3. Calvin W. Rice, secretary, 29 W. 39th St., New York, N. Y.

NATIONAL METAL CONGRESS & EXPOSITION
174th Regiment Armory, Buffalo, N. Y., Oct. 3-7. Sponsored by A.S.S.T., with cooperation of A.S.M.E., Institute of Metals and Iron & Steel Divisions of A.I.M.E., A.W.S., and the Wire Association. W. H. Eisman, 7016 Euclid Ave., Cleveland, Director.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Ind., Anderson—The Guide Lamp Corp., plans constructing a 2 story, 50 x 200 ft. addition to plant. Will purchase new tool room equipment and two 225 hp. boilers. Owner builds.

Ind., Indianapolis—C. & G. Foundry Co., 1026 Kentucky Ave., awarded contract for the construction of a 1 story, 160 x 160 ft. foundry at 25th and Yandes Sts. Estimated cost $40,000.

Ind., Indianapolis—Firestone Service Co., 502 North Delaware St., awarded contract for the construction of a plant at 1030 East North St. Estimated cost $40,000.

Ia., Sioux City — Sioux City Broom Works, 7th and Clark Sts., E. Chesen, Mgr., plans alterations and improvements to a 3 story factory recently damaged by fire. Estimated cost $12,000.

Ia., Waverly—A. Bruns, will build a 1 story, 25 x 52 ft. repair and service garage. Private plans.

Md., Salisbury—Holt Oil Co., having plans prepared for the construction of a group of bulk oil and service stations. Estimated cost exceeds $40,000.

Minn., Cass Lake—E. Christensen, awarded contract for the construction of a 1 story, 50 x 80 ft. addition to repair and service garage at 301 First St. NW. Private plans.

Minn., Crosby—H. H. Garceau, will construct a 1 story, 50 x 76 ft. repair and service garage. Private plans.

Minn., Eveleth—J. Paxxelli, awarded contract for the construction of a 1 story, 53 x 128 ft. repair and service garage at Fayal Road and Adams Ave. Estimated cost $20,000. Elwin H. Berg, Eveleth, Archt.

Minn., Minneapolis—Lyle Culvert & Pipe Co., 171 27th Ave SE., having plans prepared for the construction of a 1 story, 44 x 101 ft. factory addition. Ekman, Holm & Co., 701 Phoenix Bldg., Archts.

Mo., Hannibal—Missouri State Highway Dept. Jefferson City, awarded contract for the construction of a 2 story, 43 x 53 ft. office building and a 1 story, 66 x 98 ft. garage on U. S. Highway 61. Estimated cost $64,900.

Mo., St. Joseph—Missouri State Highway Dept., Jefferson City, awarded contract for the construction of a 2 story, 43 x 53 ft. office building and a 1 story, 66 x 98 ft. garage on Hihgways 71 and 169. Estimated cost $61,000.

N. J., East Orange—Standard Oil Co. of New Jersey, 185 Washington St., Newark, are taking bids for a 1 story, auto service station at Main St. and Oraton Parkway. Private plans. Estimated cost $40,000.

N. J., Little Falls—Little Falls Laundry Co., 101 Main St., will take bids about Aug. 15, for 2 and 3 story garage on Main St., here. Estimated cost $175,000. F. W. Wentworth, 140 Market St., Paterson, Archt. O. E. Goldschmidt, 110 West 40th St., New York, Mech. Engr.

N. J., Newark—Alling Corp., 33 Ward St., awarded contract for constructing a 1 story garage at 36-42 Columbia St. Estimated cost $40,000. U. S. Post Office Department, Washington, D. C., lessee. Noted May 5.

N. J., Plainfield—Samuel Slansky, 520 East 7th St., has completed plans for a 1 story garage at 427 East 3rd St. Owner will build by separate contracts. Private plans. Estimated cost $40,000.

N. Y., Beacon—Department of Correction, State Office Bldg., Albany, will receive bids until July 28 for construction of a machine work shop, etc., at Matteawan Hospital.

N. Y., New York—Marks Bros. Holding Corp., M. Marks, Pres., 470 East 133rd St., have awarded contract for a service garage at St. Anns Ave. Boulevard and 132nd St. Estimated cost to exceed $115,000. Noted May 10.

N. Y., Thiells—Commissioner of Mental Hygiene, State Office Bldg., Albany, will receive bids until July 27, for construction of industrial building, addition to women's service building, Boys Service Building, etc., at Letchworth Village, here.

O., Cincinnati — Metal Specialty Co., 1533 Riverside Dr., have rejected bids for constructing 2 story office and factory at Langdon Road. Project is indefinitely postponed. Noted June 16.

Pa., St. Marys—Elk Engineering Works, plans reconstruction of pattern shop damaged by fire. Estimated cost $25,000.

S. D., Mitchell—Chicago, Milwaukee, St. Paul & Pacific R.R. Co., Union Station Bldg., Chicago, Ill., awarded contract for the construction of a machine shop and a 2-stall engine house. Estimated cost $25,000.

Tenn., Memphis—Memphis Bonded Warehouse Co., Inc., Ellis B. Anderson, Pres., 20 Adams Ave., are having preliminary plans prepared for the construction of a river and rail terminal including grain elevator, oil storage tanks, a 1 story and a 3 story building at Wolf River. Estimated cost $1,000,000.

Tex., College Station—Board of Directors A. and M. College, S. G. Bailey, Secy., will receive bids until July 4th, for the construction of a petroleum engineering building. F. E. Giesecke, Archt.

Wis., Cuba City—C. F. Steinbach, having plans prepared for the construction of a 1 story, 40 x 70 ft. repair and service garage.

Wis., Stevens Point—Reliance Oil Co., Clark and First Sts., plans a group of service stations at various locations. Owner will build by separate contracts. Estimated cost $40,000.

B. C., North Vancouver—Capiland Timber Co., Ltd., having plans prepared for the construction of a power plant, shingle mill, lath mill and saw mill. Estimated cost $250,000.

Man., Winnipeg—Ault and Wiborg Co. of Canada, 179 Bannatyne Ave., plans the construction of a plant for manufacture of printers inks and rollers at Henry and Stanley Sts. Architect not appointed.

Man., Winnipeg—Winnipeg Bridge Co., Ltd., Lombard Bldg., having plans prepared for the construction of a steel fabrication plant addition at St. Joseph and Grandin Sts.

Que., Pont Rouge—Noramdeau Garage Co., having plans prepared for the construction of a public garage. Estimated cost $28,000.

Que., Sorel—Sorel Steel Foundries Ltd., having plans prepared for a plant addition. Estimated cost exceeds $40,000.

Belgium, Bruges—Municipality of Bruges and Bruges Zelvaart Instellinger Co., having plans prepared for the extension and equipping of inner port including warehouses, quays, electric cranes, etc. Estimated cost exceeds $1,000,000.

Equipment Wanted

D. C., Wash. — Bureau of Yards & Docks, Navy Dept., will receive bids until June 28, for motor driven milling machine and attachments schedule 8241 for New York or San Francisco.

D. C., Wash.—Bureau of Yards & Docks, Navy Dept., will receive bids until July 5 for 4 motor-driven sliding head drill machines, schedule 8273; 8 motor-driven grinders and 4 buffing and polishing machines, schedule 8265; 5 pneumatic hoists, schedule 8264 for New York or San Francisco.

D. C., Wash. — General Purchasing Officer, Panama Canal, will receive bids until July 1, for 6 motor-driven valve operators, 1 motor-driven drill press; Schedule 2763.

Mass., Boston—City, A. M. Sullivan, Business Manager of School Committee, will receive bids until June 27 for furnishing shop supplies for city schools, including sheet metal, welding, automobile supplies, smelting products, pipe and fittings, etc.

O., Akron—Palmer Match Co., Corey Ave., plans to expand its factories in this district and install machinery for the manufacture of book matches. Estimated cost $100,000.

Wis., Clyman—W. H. Kuenzi—woodworking outfit in group or single units, 8-in. saw, 9 x 36 in. lathe.

Ont., Orillia—G. L. Milligan, Machinery and equipment for barrel factory, in connection with rebuilding to replace fire loss. $30,000.

A Personal Want— can invariably be filled by a friend.

The Searchlight Section of this issue covers the current business wants of the industries in which this paper is read.

For Every Business Want "*Think* SEARCHLIGHT *First*"

A Business Want— must be satisfied by someone in your industry.

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